# ELECTRICAL REVIEW

## and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXII, No. 18. CHICAGO, SATURDAY, MAY 3, 1913. ISSUED WEEKLY.

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

**ELECTRICAL REVIEW PUBLISHING COMPANY**

608 SOUTH DEARBORN STREET
CHICAGO

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SUBSCRIPTIONS.

One Year, United States.....$3.00
One Year, Canada.....4.00
One Year, Foreign Countries.....6.00
Single Copy, 10 cents. Back numbers, beyond one month, each .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.


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## FREE RENEWALS OF TUNGSTEN LAMPS.

As noted elsewhere in this issue, the Hartford Electric Light Company has instituted the policy of giving free renewals of tungsten lamps in the larger sizes. The inauguration of this policy may be regarded as a forerunner of similar procedure in the case of a large number of central-station companies, as the tendency in this direction is clearly marked. Most of the central stations of the country are now giving free renewals of carbon lamps with metalized filaments, and the general attitude of the electric light companies is to encourage among consumers practices which will give them the best service.

With the tungsten lamp of today in its perfected condition, there is little reason why lighting installations generally should not be equipped with this type of lamp. Fragility is no longer a bugbear. The specter of the load cut in half no longer confronts the central station. Most of the large installations are already thus equipped, and it is the small householder who is likely to make changes now if he understands the real situation. It is to be noted that the Hartford Company is not yet offering renewals in the sizes smaller than 60 watts, so there is no danger of a stampede to the more efficient lamps. So long as carbon lamps are furnished free by the central station, while tungsten lamps must be purchased by the customer, there will remain a large contingent of small consumers who will stick to the carbon. Even though the 60-watt lamp which is offered for free renewal will have a consumption but slightly in excess of the most common size of carbon lamp, while giving approximately three times the amount of light, it is not to be expected that customers will rush to make the change. There is usually a lurking suspicion under circumstances of this kind that there is some hidden advantage which will inure to the central station while the customer is being penalized in some way.

This attitude of the average consumer was well brought out at the recent hearing before the Wisconsin Railroad Commission, reported in our last issue. The Commission's engineers had proposed tentatively a rule requiring every central station to inspect the lamps of each consumer at least once every two years and render them assistance in securing lamps best adapted to the service. Testimony from central-station men who had attempted such service upon their own initiative showed that it was not favorably received by the customer in most cases, as the average customer is unable to realize that a utility company may be doing something for his advantage. He usually has the notion that there is a

conflict of interest between himself and the utility company, and that anything which is favored by the company must be disadvantageous to him. The attitude of not wanting advice from central-station officials is so general that companies who have attempted anything of the kind have soon abandoned it and have adopted the policy of offering assistance only where the customer has first indicated a desire to receive it. It will be interesting to learn, therefore, whether there is any marked tendency among the customers of the Hartford Company now using 50-watt carbon lamps to replace them with tungsten units of the 60-watt size.

## THE ELECTROCHEMICAL EQUIVALENT OF SILVER.

The choice of the silver coulometer as an apparatus for the accurate measurement of electric current made the value of the electrochemical equivalent of silver one of the important constants of electrical science. Many series of careful experiments have been made from time to time by scientific investigators to fix the true value of this quantity in both absolute and practical units, but there have been many discrepancies between the results of these experimenters. When the practical unit of electric current, the ampere, was defined in terms of this constant its importance was all the more emphasized and the desirability of determining the sources of the discrepancies in coulometer work became equally important.

The London conference in 1908 defined the ampere to be that value of an unvarying electric current which in one second caused the deposit of 1.11800 milligrams of silver. In practical units this fixed the value of the electrochemical equivalent of silver by definition. Since the value of the volt is defined in terms of the ohm and the ampere, its determination became dependent upon the absolute value of the electrochemical equivalent and its practical realization was still dependent upon any variations which might arise in the use of the silver coulometer. In practical work the standard cell is usually made the basis for measurements of both voltage and current, and it was, consequently, of importance to fix once for all the value of the unsaturated Weston cell as a working standard of electromotive force. Representatives of the different national standardization laboratories after a joint investigation agreed upon the value 1.0183 volts at 20 degrees centigrade for the value of the unsaturated Weston cell.

More recent work at the Bureau of Standards, Washington, D. C., has brought to light the causes for the former disagreement in the values obtained with the silver coulometer and have shown the very constant and definite results that can be secured when the causes of these variations are avoided. A report upon this work was made by Messrs. Rosa, Vinal and McDaniel at the meeting of the American Physical Society last week. It was shown that the presence in the electrolyte of acid to the amount of one part in a million produces a decrease in the amount of silver deposited by four parts in a million. The uncertainty in the neutrality of the electrolyte is given as one cause of the divergent values previously obtained, while the presence of filter paper was the cause of still greater variations. A very slight difference is still found between the form of coulometer using the porous pot and the newer form used at the Bureau. The value of the Weston cell using the former is found to be 1.018267, whereas with the latter it is 1.018274 volts.

The investigation which has led to the elucidation of these troubles and a practical concluson of the long mooted question as to the true value of this constant has required a number of years for its completion and the close application of several trained investigators supplied with every laboratory convenience.

## OVERHEAD EXPENSE AND BUSINESS EFFICIENCY.

When electrical contractors take us into their confidence and tell us the percentages they have found it necessary to add to the cost of labor and material on various typical jobs, we sometimes get some most valuable information. The amount of information of this kind available to the beginner in the contracting business who may need it as a check on his own methods of operation is not nearly so large as might be desired. A fact that needs emphasis is that, expressed as a percentage of the cost of labor and material, the overhead costs of different high-class contractors ought not to differ greatly on the same class and grade of work. For example, in certain neighborhoods in a city like Chicago there are large numbers of so-called flat buildings, all of which are practically identical in design and structural details, and all of which are wired in essentially the same manner. The overhead expenses of two different contractors doing the same quality of work on these buildings should be about the same. Any considerable difference would have to be taken as pretty safe evidence that the business methods of one or the other or both were faulty.

While all contractors ought to insist on reasonable prices for work to be undertaken, no contractor has anything to gain by boosting the actual cost of a job. To do this would be to encourage a waste of money, and wastefulness can seldom be defended in any sort of enterprise. The fact is, the contractor who can keep the cost of high-class work lowest is the contractor who, other things being equal, may be counted upon to succeed. Overhead expense is an element of the cost of installation. But it and certain other elements of ultimate cost are closely interdependent, and the really skillful contractor is the man who has discovered the secret of keeping the ratio of fixed costs to other costs such as to get the installation in without any waste of money. That there are men in the business, more than a few of them, who have not made this discovery is rather uncomfortably evident even from the meager data acces-

sible. The effort of the last few years has been to get the contractor to realize that there is always an overhead expense; more information as to what this overhead ought to be in typical classes of construction would be equally helpful to him. It is hard to see why one man should have to add 40 per cent to take care of fixed charges while another finds 10 per cent enough. It is not meant, however, that either percentage is the one which would universally apply.

## MEMBERSHIP TRANSFERS IN THE AMERICAN INSTITUTE.

As intimated in our issue of April 19, dissension has arisen in the American Institute of Electrical Engineers over the interpretation of the special section of the Constitution which was adopted last year to facilitate transfers from one grade of membership to another. At that time the constitution was amended to create an additional grade, known as Fellow, while the qualifications for the grade of Member were made less severe. The regular routine for transfer from one grade of membership to another as laid down by the constitution consists in reference by the applicant for transfer to a number of other members of a grade at least as high as that to which transfer is desired. Elections and transfers must be by vote of the Board of Directors and two negative votes are sufficient to exclude a candidate. The Board of Examiners is required to pass upon the qualifications of all applicants for election or transfer whose applications conform with the prescribed conditions, and this board must then report its findings to the Board of Directors for action.

To facilitate the transfer of the large number of members who it was expected would make application therefor upon the establishment of the new grade of membership, a special section of the constitution was adopted which gave the right to a Member to become a Fellow, and to an Associate to become a Member, by referring to the requisite number of Members or Fellows to certify that he meets the requirements of the grade. The interpretation of this section is a bone of contention. A majority of the Board of Directors has taken the view that it is not necessary for the Board of Examiners to pass upon these applications and that it is mandatory upon them to transfer all applicants who have secured the specified certifications. A majority of the Board of Examiners, on the other hand, claims that this section did not invalidate the section of the constitution which permits the Board of Directors by two negative votes to exclude a candidate, and that the Board of Examiners has the same duty of investigation into the qualifications of applicants under this section as of applicants under the general provisions of the constitution. Both views of the matter were supported by the opinions of legal counsel. Owing to inability on the part of the Board of Examiners and the Board of Directors to agree upon the procedure in making transfers, a majority of the Board of Examiners resigned from that board.

Not satisfied with the decision of the Board of Directors in this matter and believing that the Board's attitude is not in conformity with the correct interpretation of the constitution, three prominent members of the Institute have instituted a legal suit to restrain the Board of Directors from transferring or electing any person to the grade of Fellow or Member without considering and deciding whether such person has the qualifications required by the constitution. The plaintiffs in this suit are Francis B. Crocker, Louis Duncan and Michael I. Pupin. That the question is to be regarded as a serious one and not a quibble is indicated by the fact that the president of the Institute is not in agreement with a majority of the Board of Directors in this matter and by the prominence of the men who have instituted the suit, two of whom are past-presidents of the Institute, while the attainments of the third are such as to have merited for him the same honor.

It is unfortunate that such a difference of opinion and of constitutional interpretation has arisen between two groups of men in the Institute, both of whom undoubtedly have its welfare at heart and are sincere in their desires to promote its best interests. This difference is one which has its foundation in the purpose for which the special section of the constitution was adopted. Since such an instrument should, wherever its language permits of two interpretations, have read between its lines the intent and purpose of those who adopt it, it would seem that in this case the proper interpretation could best be settled by a vote of the membership rather than an appeal outside of its membership to a court of law. Since the membership has the unquestioned power of amending the constitution of the Institute, it is only consistent with this principle of government that, in a case where there is such serious opposition to the decision of the Board of Directors, the matter should be placed before the entire membership for decision.

Since the Board of Directors did not see fit to take such steps toward a settlement, nor to submit the matter to other legal decision, as proposed in a communication to it, signed by the plaintiffs in this case, by three members of the Board of Examiners and by two other past-presidents of the Institute (Messrs. F. J. Sprague and S. S. Wheeler), the plaintiffs evidently considered a legal suit the only method of appeal from the decision of the Board.

Since the period during which the special section was to be operative has now expired, a decision of the court in the matter can have little effect unless it is made retroactive and shall apply to all transfers made during the past year under the provisions of this special section. If the court should annul all such transfers it would create great confusion in Institute affairs, since there would be no one eligible to fill the offices of president and vice-president of the Institute, and the acts of the present officers might be invalidated. While it is true that several Fellows have been transferred under the regular provisions of the constitution, these transfers would also be invalidated, since the (supposed) Fellows to whom reference was made would turn out not to be Fellows at all.

## Co-operation of Engineering Societies.

A joint meeting of the Chicago Section, American Institute of Electrical Engineers, and the Electrical Section, Western Society of Engineers, was held at Chicago on the evening of April 28. An election of officers for the ensuing year for the Chicago Section, American Institute, was held and resulted as follows: chairman, D. W. Roper; secretary, E. W. Allen; member of Executive Committee, R. H. Rice.

W. F. M. Goss, dean of engineering, University of Illinois, and president of the American Society of Mechanical Engineers, was then called upon to preside over the meeting. He introduced Ralph D. Mershon, president of the American Institute of Electrical Engineers, who made an extemporaneous address, taking as his theme the co-operation of engineering societies. He referred to the manner in which this had been carried out in Chicago to perhaps a greater extent than in any other of the large centers of the country. The desirability of co-operation among the engineering societies is pronounced, but as yet relatively little has been accomplished in this line. He referred to the co-operative conference between the engineering societies in New York state respecting the proposed legislation aiming at the licensing of engineers. The future formation of a joint national engineering society had been suggested but whether such would be desirable or not was an open question. At any rate it probably would be in the relatively distant future.

Mr. Mershon thought that co-operation of engineering bodies was particularly desirable as to the consideration of civic and national engineering problems that were of interest to the community at large and involved more than one line of engineering effort. He referred to the proposed appointment of a commission on which a number of engineers shall be represented to make a study of the rehabilitation of cities that were recent sufferers from severe floods.

As a very fruitful field for co-operation among engineering bodies was the very desirable reform of the patent system of this country. Mr. Mershon dwelt at some length on various ways in which an inventor or manufacturer of small resources is sometimes deprived of the value in any patents he may possess. Improvements in the housing of the Patent Office, its staff, its methods of search, and reform respecting the conduct of patent litigation were highly desirable. Such reform, however, would have to be brought only as the result of very careful and thorough consideration of the many phases of the subject, and he, therefore, advocated that a commission should be appointed to make an exhaustive study of the problem. This commission should be composed of representatives of engineering bodies, inventors, manufacturers, and all interests affected by patents.

The general subject was discussed at some length by a number of speakers, among whom were A. Reichmann, president of the Western Society of Engineers; P. M. Chamberlain, chairman of the Chicago Section, American Society of Mechanical Engineers; A. Scheible, S. Montgomery, P. Junkersfeld, W. C. Bauer, D. W. Roper, R. F. Schuchardt, A. Bement, W. B. Jackson, P. B. Woodworth and Mr. Mershon.

At the next joint meeting of the two sections, to be held May 26, H. E. Chubbuck, of the Illinois Traction System, will make an address dealing with some aspects of electric railroading.

## Program of Southwestern Association Meeting.

The annual convention of the Southwestern Electrical and Gas Association will be held at Galveston, Tex., on May 21, 22, 23 and 24.

On Wednesday morning and afternoon there will be street-railway sessions with papers on "Concrete Track Construction," "The Use of Traffic Charts for Rush Service," "Old and New Ideas in Car Design," and "Street Railway Planning in Growing Cities." At the same time there will be parallel sessions for the gas members.

The two sessions on Thursday will be devoted to light and power, and papers will be presented on the following subjects: "Erection and Protection of High-Tension Lines and Apparatus," "Oil Engines for Light and Power Plants in Small Towns and Cities," "Economical Operation of Light and Power Plants in the Small Town," "The Proper Basing of Rates by Light, Power, Gas and Water Utilities in Texas."

On Friday morning there will be a general session and also a parallel session for accountants. At the former there will be papers entitled "The Purification of Feed Water for Steam Boilers," and "Fire Prevention as Fire Protection." At the accountants' session there will be a paper upon the subject "The Necessity of a Standard System of Accounting for the Small and Medium-Sized Public Utilities of Texas." There will also be an exhibition of forms used by the different companies.

The business session will be held on Saturday morning.

## Chicago Electric Club Meeting.

At the meeting of the Electric Club on April 24 a stereopticon lecture on "Wild Animals I Have Met" was given by Cyrus B. De Vry, director of the Zoological Department of Lincoln Park, Chicago.

## Election of Officers of New York Companies' Section.

The entire list of new officers for the New York Companies' Section, National Electric Light Association, was unanimously elected at the meeting of the Section on April 21.

H. M. Edwards, auditor of The New York Edison Company, elected chairman of the Section, was the principal speaker of the evening, taking as his subject "Public-Service-Corporation Accounting."

At the conclusion of the paper, a number of members took part in an informal discussion.

Among those participating in the discussion were: W. E. Freeman, H. M. Brundage, C. A. Littlefield, L. A. Coleman, H. L. Snyder, J. C. Van Duyne, F. C. Henderschott, W. L. Bruce, E. A. Norman, Clarence L. Law and Albert Goldman.

After the formal part of the program, the meeting was turned over to the Entertainment Committee and a series of moving-picture comedies was shown.

Arthur Williams, general inspector of The New York Edison Company, is to speak at the meeting on May 19 on "Welfare Work."

## Stage Lighting to be Discussed in New York.

At the meeting of the New York Section, Illuminating Engineering Society, to be held on Thursday, May 8, at 8:15 p. m., at the Clymer Street Theater, Brooklyn, N. Y., a lecture on stage lighting will be presented by Bassett Jones. There will be demonstrations with scenery, modern stage-lighting devices and living models.

The meeting will be preceded by a dinner at the Cafe Boulevard, Second Avenue and Tenth Street, at 6 p. m. Admission to the lecture will be by ticket only, which may be obtained from Clarence L. Law, secretary, 124 West Forty-Second Street, New York.

## Joviation in Baltimore.

Members of the Jovian Order of Baltimore, Md., held their second rejuvenation and joviation on Wednesday, April 24, at the Hotel Emerson. Thirty-three members were initiated, following which an elaborate banquet was served. Addresses were delivered by C. L. Hight, of New York, and Melvin L. Jones. Mr. Jones spoke on "The Jovian Order and Its Possibilities."

Between the courses a number of popular songs were sung under the leadership of Statesman Jones. The initiation committee consisted of J. W. Crowley, John V. Brian, Frank J. Kernan, M. J. E. Roddy, Edward T. Bevan, Harry L. Lemmert, W. Harry Coleman, Robert C. Faught, H. L. Patterson and W. A. Williamson.

## F. A. Vaughn.

There is an old saying to the effect that if you want something done give the job to a busy man. The record for enterprise and activity which has been established by F. A. Vaughn, and the many things which he has found it possible to accomplish in addition to working strenuously at his regular job, lead us to believe that in his case at any rate a great many good people have followed the meaning and application of the old saying very literally.

Francis Arthur Vaughn was born at Prairie du Chien, Wis., on December 6, 1871. He received his public and high-school education at Madison, and graduated from the electrical engineering course of the University of Wisconsin in 1895. During 1893 and part of the year 1894, he was a senior member of the firm of Vaughn & Cosgrove, electrical wiremen and contractors. Later he was employed successively in the testing department of the Standard Telephone Manufacturing Company of Madison, as draughtsman with the Gibbs Electric Company of Milwaukee, manufacturers of electric motors, and with the electrical engineering department of the Milwaukee Electric Railway and Lighting Company in 1896. Subsequently he remained with the latter organization expanding with this position for 14 years, passing by successive stages through power house operation, keeping of station records and standards, drawing of maps and inventory records of electrical apparatus and distribution systems, chief draughtsman in the design of electrical equipment, of power houses, of sub-stations, superintendent of meter and testing departments, in charge of all the designs, estimates and specifications, of all electrical improvements, overhead and underground distribution of all railway and lighting systems, electrical engineer for the lighting department, including superintendence over this department, and the erection and construction, as well as the design of power houses and sub-station electrical equipment. His work embraced practically every phase of low-tension and high-tension, direct-current and alternating-current construction, generation and transmission. In the building of the 66,000-volt, three-phase, 25-cycle, 120-mile steel-tower transmission line and the 12,000-volt, direct-current railway work he was practically a pioneer.

Since April 1, 1910, Mr. Vaughn has been associated as senior partner with the firm of Vaughn & Meyer, consulting electrical engineers, in Milwaukee. This firm is also the consulting engineer for the State Board of Control of Wisconsin. This firm has now become Vaughn, Meyer & Sweet.

So much for his regular activities. In addition to this he has been active in professional society work as a member of the power station committee of the American Institute of Electrical Engineers, chairman of the Chicago Section of the Illuminating Engineering Society, secretary of the 1912 committee on meters of the National Electric Light Association, chairman of the 1912 advisory committee on street lighting of the same organization, chairman in 1912 of the Milwaukee Section of the American Institute of Electrical Engineers, president of the Milwaukee Electrical League, trustee of the Engineering Society of Wisconsin, and chairman of the committee on revision of the Wisconsin Railroad Commission electric service rules for the Wisconsin Electrical Association, having in charge constructive criticisms and suggestions from the public utility companies of Wisconsin regarding rules proposed by the Railroad Rate Commission. As secretary of publications of the meter committee of the National Electric Light Association he had charge of the *Meterman's Handbook*, which has become a standard work and a classic of its kind.

F. A. Vaughn,
Consulting Engineer.

## Plans of Society for Electrical Development.

The contest announced by The Society for Electrical Development to secure a suitable trade-mark to be used by its members and by the Society in its various campaigns to develop the uses of electricity, has been productive of almost an embarrassment of riches, and the accumulated ideas and suggestions that await the meeting of the Slogan Committee on May 5 should produce a design and slogan eminently suited for the Society's purpose.

The great mass of ideas and suggestions made at the recent conference in New York for the active work of the Society will give ample scope for the work of the Committee on Plans, which has been called to meet May 6 to evolve with the co-operation of the Executive Committee, the complete plans for carrying out the work of the Society, which will be started when the minimum of $200,000 has been subscribed for this purpose.

The comprehensive plan will be presented to the membership at the annual meeting of the Society, which in all probability will be held in Chicago during the last week in May. Plans will be presented to the industry at large in a publication which will be distributed shortly after the meeting.

The membership of the Society is making a rapid increase and the expectation is that the annual meeting in Chicago will be attended by a large number of representative men in the industry.

The big broad scope on which the Society's plans are to be organized should effect a great increase in the uses of electricity, through which every individual interest engaged in the industry will profit. Hence a very complete co-operation of the various interests in the industry is expected, both in the development of the plans and in the subscriptions.

## Anniversary of Austrian Electrical Society.

The Elektrotechnisher Verein of Vienna, Austria, has completed its thirtieth year and celebrated the anniversary with a special issue of *Elektrotechnik und Maschinenbau*. This issue comprises 118 pages of reading matter in addition to a special advertising section. It contains a number of articles dealing with the development in different branches of electrical engineering by prominent authorities in their respective subjects.

## AMERICAN PHYSICAL SOCIETY.

### Spring Meeting at Washington, D. C., April 25 and 26.

The American Physical Society held a two-day meeting at Washington, D. C., on April 25 and 26. There were altogether 37 papers on the program, of which only a few can be mentioned here.

A paper was presented by B. Osgood Peirce on "The Maximum Value of the Magnetization in Iron." The author outlined the earlier work on this subject, giving some of the principal values which had been found for the intensity of magnetization of iron at saturation. These varied up to 1,850 C. G. S. units, the value found by DuBois in 1899. The value found by the author was 1,751 C. G. S. units. Earlier investigators used various modifications of the isthmus method. This assumes that the magnetic field measured in the air surrounding the specimen is the same as that acting within the test piece. The author has used a straight solenoid, carrying current of 100 amperes, which would produce a magnetizing field of 5,000 units. This coil consumed from 50 to 60 kilowatts and to reverse the current presented some difficulties. The reversal of magnetization in some cases occupied as long as 48 seconds, so that it was necessary to have a ballistic galvanometer of very long period and one having a period of ten minutes was used. The apparatus is water-cooled. Curves plotted between the reciprocal of the susceptibility and the magnetizing field become straight lines for high values of this field. The difference in the results found by different experimenters may be due in part to the purity of the material, as the author found that one per cent of carbon content decreases the saturation value by six per cent. On the other hand some samples of Bessemer steel have given values as high as the purest iron.

In answer to a question by C. W. Burrows, the author stated that values accurate to within probably two per cent could be obtained by plotting a curve between the reciprocal of the susceptibility and the magnetizing field for values of the latter not exceeding 300 units and extending this line to higher values.

F. B. Silsbee read a paper entitled "A New Method of Comparing Mutual Inductances." The primary windings of the unknown and the standard inductance are connected in series with a source of alternating current. A calibrated slide wire is connected in parallel with this source (if necessary through a transformer). The currents in the two circuits are adjusted to quadrature either by a phase-shifting transformer or by inserting inductance and capacity. The secondary voltages of the standard and unknown coils are in turn balanced against the resistance drop in a known length of the slide wire. The balance on the standard coil is attained by successive adjustments of phase and magnitude of the current in the slide-wire circuit, while the unknown is balanced by changing the length of slide wire between the potential taps. Either a vibration galvanometer or a telephone may be used as a detector. The method is particularly useful in laying off the scale on a variable mutual inductance where a large number of points of successively increasing value are needed. It is especially applicable when the unknown coil is of low inductance and large current capacity since the primary current does not have to flow through any precision resistances. The apparatus required is simple and inexpensive. Its accuracy depends upon the detector and in practice has been between 0.5 and 0.1 per cent.

H. L. Curtis described a vibration electrometer which consisted of a suspended vane moving between a set of fixed sectors. The suspension is of the bifilar type passing over a fixed ivory pulley at the top and a movable one at the bottom. This bottom one is attached to a spring by which the tension may be adjusted. The wires also rest lightly against two small ivory rollers which keep the moving system properly oriented. In operation the moving vane is charged to a constant potential of 40 volts. One essential difference between this instrument and previous types is in the nature of the damping. In most instruments the mechanical function is the predominant element in damping. In this one the mechanical friction is quite small. Thus the damping is due largely to the function of the air. This is eliminated by exhausting the air from the case containing the apparatus. Curves were shown to illustrate the sensitivity and the nature of the tuning at several different air pressures.

A paper by E. B. Rosa, G. W. Vinal and A. S. McDaniel entitled "Final Results with the Silver Voltameter" was presented by Mr. Vinal.

In 1910 representatives of the National Physical Laboratory, the Reichsanstalt, and the Laboratoire Centrale met at the Bureau of Standards and after some joint experimentation agreed upon the value of the Weston cell as 1.0283 volts at 20 degrees Centigrade. Work has been done at the Bureau since then with the porous pot and the new form, yielding as the most probable values today respectively, $1.0182_7$ and $1.0182_4$ volts. This close agreement is due to the great care in the preparation of the materials. It is found that the presence in the electrolyte of acid to the amount of one part in a million produces a decrease in the amount of deposit of four parts in a million. If all the acid is expelled there is a tendency toward decomposition and for the electrolyte to become alkaline. This uncertainty in the neutrality of the electrolyte is given as a cause of the divergent values previously obtained. The present work was done with neutral silver nitrate. Careful experiment shows that the loss of silver from the anode equals the deposit on the kathode to within a few parts in a hundred thousand. Recent papers are still suggesting the existence of a complex ion at the anode. Work at the Bureau of Standards has shown that the difficulties found were due to the presence of the filter paper rather than to a complex ion. The heavy anode liquid has been used surrounding the kathrode and no difference was perceptible. These experiments show quite conclusively that the anode liquid is not complex and that the two liquids yield identical ions. The voltameter is a primary standard and hence the highest accuracy is required. The London conference in 1908 gave as an argument for the adoption of the voltameter, its simplicity. If the electrolyte is pure and care is used, the instrument is indeed simple.

Frank Wenner described a modification of the Carey Foster method of comparing resistances, suitable for the measurement of inaccessible resistances. The method was developed for use in checking the resistances of a number of similar conductors connected in series, as for example, the coils of a low-resistance potentiometer.

F. Wenner and E. C. McKelvey presented a preliminary report on methods for measuring electrolytic resistance. Their plan is to insert a third electrode into the electrolyte between the two electrodes used for the measurment. In this way it is possible to eliminate the polarization effects which ordinarily produce difficulties in measurement. This polarization is not strictly equivalent to a capacity effect and cannot be eliminated by the use of external inductance or capacity. The cell is connected to the bridge in the usual way and the vibration galvanometer used as a detector.

## Small Electric Plants Numerous in Norway.

An American consular agent at Christiana, Norway, states in a recent report that probably more small towns and hamlets in Norway use electricity than in any other country, owing to the abundance of water power. In the country districts not only are there plants for each collection of five or six houses, but in many cases even small farms have their own generating plants.

# Electricity for Garages.

It is practically impossible to treat the subject of electricity for garages from the purely power standpoint, as in soliciting this class of business central stations must of necessity advocate the merits of transportation by means of electrically propelled vehicles.

One of the wonders in the industrial world of recent years has been the almost phenomenal development of the gasoline automobile business and this activity has no doubt had a marked effect on electric-vehicle development. The question is now no longer between power and horse-drawn vehicles, but which of the various types of automobiles is best fitted for the purposes at hand. The increase in the use of electrics naturally increases the field for the sale of power and as the furnishing of power for this class of business is from the nature of its load essentially a central-station proposition it is necessary to have the closest co-operation between the manufacturer, dealer and central-station company in order to attain the maximum development.

At the present time the electric vehicle affords one of the best fields, the exploitation of which will build up the load-factor in a very gratifying way and with practically no investment charges. In fact it is the practice of at least one large company to take on individual charging equipment without providing capacity in transformers, as battery charging is done late at night or early in the morning, when the demand of other consumers is practically nil. In other words, as far as investment is concerned this battery load is perhaps the most desirable of any other class of central-station business.

It is perfectly obvious, however, that daily operating costs are at a minimum when the load is practically constant throughout the entire 24 hours. Under these conditions the labor cost per unit of output is low and the boiler room can be operated at highest efficiency and the losses due to banking of fires, etc., all eliminated. The savings which can be effected in this way are second only to savings in the investment due to a high annual load-factor.

Through the courtesy of George H. Jones, of the Commonwealth Edison Company, who has done notable work in the exploitation of electric vehicles in Chicago, some interesting curves and data are given that indicate graphically the desirability of the battery-charging load. In Fig. 2 there is shown a daily load curve of a prosperous modern electric garage taking care of from 60 to 75 pleasure vehicles. This garage is being operated by central-station current and under a limited-hour contract, which permits charging to be done at any time of the day during the summer months but during the winter months no charging is allowed during the time of peak hours of the central station, viz., between the hours of 4 and 8 p. m. A garage for commercial trucks would have a somewhat different curve, as the heavy load would be put on it about 8 o'clock and continue more or less steadily throughout the night. Then, too, a considerable load will be built up at noon for boosting, and this also offers about the only means by which central stations can fill in the heavy noon-hour depression in the daily load curve.

In Fig. 3 is shown the variation in

Fig. 1.—Electric-Truck Garage, Showing Switchboard With Individual Watt-Hour Meters.

monthly consumption of the garage referred to in the above as handling 60 to 75 pleasure cars. This curve is rather interesting in that it shows how loads fall off in August, due to presumably the vehicle owners being absent during the vacation period.

The Commonwealth Edison Company has been among the foremost in advocating the use of electric vehicles and consequently has built up a very substantial load among charging stations. An analysis of conditions on the system of this company based on three-hours' daily use of a maximum demand of five kilowatts, and 10-hours' use of a maximum of 50 kilowatts, shows a decrease of 40 per cent for private garages, and 70 per cent for public garages. The decrease has been brought about by greatly increasing the diversity-factor through the securing of off-peak business of various sorts with the consequent improvement of the load-factor and a more economical use of machinery and lines.

The Commonwealth Edison Company is at the present time supplying energy to 65 charging stations. This business was obtained on the regular power-rate schedule of the company, which provides a primary charge of 11 cents per kilowatt-hour for all electricity consumed in each month up to and including an amount that would be equal to 30 hours' use of the consumer's maximum demand. Four cents per kilowatt-hour is charged for all electricity consumed in such month in excess of 60-hours' use. A discount of one cent per kilowatt-hour on the total bill is allowed. A minimum charge of $1.50 is made for each 30-ampere mercury arc rectifier or for each 30-ampere direct-current charging plug. An off-peak schedule is also in vogue, which is a modification of this rate with the stipulation that no energy be used between 4 and 8 p. m. during the winter months. The unit price of this rate is determined by the hours' use of the maximum demand, as in the previous rate.

The Denver Gas & Electric Light Company is another company taking active interest in the electric-vehicle situation and as a result has a vehicle load calling for an output of 2,160,000 kilowatt-hours per year, which brings in an annual income of approximately $65,000. This company has made a rate of three cents per kilowatt-hour, less 50 per cent, less 10 per cent. This rate, however, entails a readiness-to-serve charge of $90 and is only applicable to public garages. For private garages the rate made includes a charge of $5.00 per month and four cents per kilowatt-hour for power used.

In Hartford, Conn., an entirely off-peak rate is offered, providing for a discount of 40 per cent on all power used off the peak, and meters are furnished free in cases where this off-peak consumption exceeds 10 per cent of the total. A minimum monthly charge of $20 is also made.

The New York Edison Company is serving about 180 public garages with an aggregate connected load of 5,600 kilowatts. The load-factor of this business averages 25 per cent. The New York rates provide a charge of five cents per kilowatt-hour for the first 2,500 kilowatt-hours and three cents for all energy consumed in excess of 5,000 kilowatt- hours per month. The monthly consumption of 50,000 kilowatt-hours or over earns a flat rate of three cents per kilowatt-hour. A minimum charge of $25 per month is made for each installation supplied under this form of contract.

The Philadelphia Electric Company of Philadelphia supplies about 21 public garages having an aggregate connected load of 422 horsepower. These customers have the option of operating under the company's regular wholesale power rates or under an off-peak rate which provides for a charge of six cents per kilowatt-hour flat.

The Edison Electric Illuminating Company, of Brooklyn, N. Y., is now providing energy for about 300 commercial trucks and 50 passenger cars. There are approximately 20 electric garages in the city, of which seven may be considered in the wholesale class. The average load-factor is approximately 20 per cent. The rate charged is based upon maximum demand and ranges from seven cents per kilowatt-hour for a single vehicle down to three cents for the public garage.

In Boston, Mass., the Edison Electric Illuminating Company supplies about 150 installations, the load-factor being between 35 and 50 per cent. The total demand is about 1,600 kilowatts. Payment for this service is made under schedule B-1. This involves a minimum charge of $1.00 per month, with an energy charge of 10 cents per kilowatt-hour for the first 20 kilowatt-hours per month; 3 cents per kilowatt-hour for energy in excess of 20 kilowatt-hours up to 2,000 kilowatt-hours, and 2 cents for all additional. This makes the net rate in the neighborhood of 3 cents.

In St. Louis, Mo., the Union Electric Light & Power Company has a connected load of 878 kilowatts, the number of installations being 163. The average load-factor, computed on the basis of connected load, is 15.7 per cent. The average net rate per kilowatt-hour for public garages is 2.28 cents and for private garages 6.3 cents. The average monthly bill for the latter has been in the past $8.35, but a recent reduction in rates will lower this. Two methods of charging are available to the customer. (1) This is the regular primary

(Continued on page 894.)

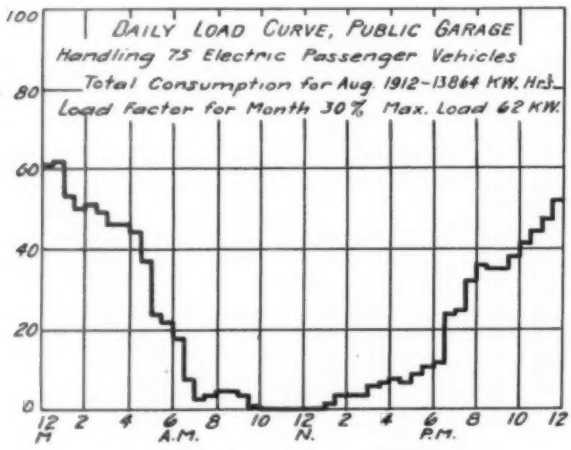



Fig. 2.—Daily Load Curve of Public Garage.

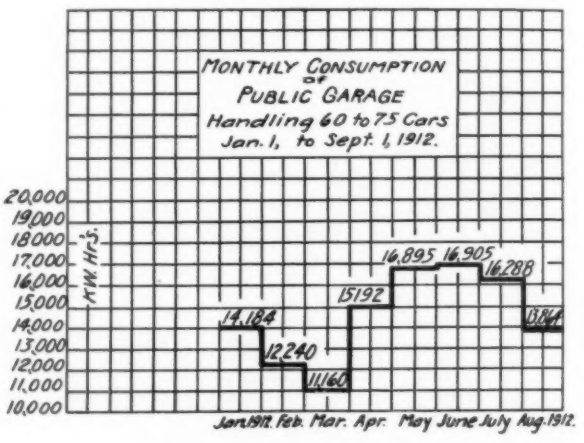



Fig. 3.—Monthly Consumption.

## Electric-Vehicle Garage Data—Sheet No. 1.

**The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors and other apparatus connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.**

Electric-vehicle garage having a capacity for 60 cars of the pleasure type and actually garaging 51. A charge of $35 per month is made for small cars and $40 per month for large forward-drive cars. This rate includes battery charging, washing, etc. A 40-ampere mercury-arc rectifier is installed for miscellaneous charging purposes and a rate of $1.00 per charge made when this is used. Charging hours average between 9 p. m. and 9:30 a. m.

Total connected horsepower, 114. Total number of motors installed, 3. Average kilowatt-hours per month, 4,398.

Kilowatt-hour consumption for 12 months:

| Month | Kilowatt-hours | Month | Kilowatt-hours | Month | Kilowatt-hours |
|---|---|---|---|---|---|
| May | 5,000 | September | 4,790 | January | 3,610 |
| June | 3,930 | October | 4,540 | February | 3,770 |
| July | 5,350 | November | 3,560 | March | 3,840 |
| August | 4,890 | December | 3,460 | April | 4,040 |

Load-factor, 7.1 per cent; operating-time load-factor, 17 per cent.

Motor Installation.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

| Number | Horse-power | Speed R. P. M. | Application. |
|---|---|---|---|
| 1 | 38 | 1,150 | Induction motor direct-connected to a 25-kilowatt, 125-volt direct-current generator. |
| 1 | 75 | 863 | Induction motor direct-connected to a 50-kilowatt, 125-volt direct-current generator. These two generators supply energy to 30 charging plugs. |
| 1 | 1 | 1,150 | Belted to a short line shaft driving one small lathe; one air pump; one lead-burning outfit; and two emery wheels. |

The garage is equipped with a five-panel switchboard comprising two motor panels and three double control panels.

Garage handling both gasoline and electric pleasure cars. The latter are housed on the second floor. The average number of cars garaged is between 30 and 35. One mercury-arc rectifier is installed for miscellaneous charging. Charging hours are from 10 p. m. to 9 a. m.

Total connected horsepower, 85. Total number of motors installed, 2. Average kilowatt-hours per month, 7,731.

Kilowatt-hour consumption for 12 months:

| Month | Kilowatt-hours | Month | Kilowatt-hours | Month | Kilowatt-hours |
|---|---|---|---|---|---|
| January | 6,430 | May | 7,840 | September | 8,240 |
| February | 3,140 | June | 7,920 | October | 8,250 |
| March | 6,170 | July | 9,020 | November | 8,790 |
| April | 7,430 | August | 11,350 | December | 8,200 |

Load-factor, 17.6; operating-time load-factor, 39 per cent.

Motor Installation.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

| Number | Horse-power | Speed R. P. M. | Application. |
|---|---|---|---|
| 1 | 75 | 1,200 | Induction motor direct-connected to a 50-kilowatt, 125-volt direct-current generator supplying 20 charging circuits. |
| 1 | 10 | 1,150 | Driving a 2,000-pound-capacity freight elevator for hoisting cars to second floor. |

Electric-vehicle garage operating from 10 to 15 hours per night. The company estimates an average cost of 60 to 70 cents per charge, depending on the size of the batteries, and it receives $1.20 per charge. All current is sold on the alternating-current side, for which the electric company receives its regular established rates.

Total connected horsepower, 45. Total number of motors installed, 2. Average kilowatt-hours per month, 8,252.

Kilowatt-hour consumption for 12 months:

| Month | Kilowatt-hours | Month | Kilowatt-hours | Month | Kilowatt-hours |
|---|---|---|---|---|---|
| January | 12,620 | May | 6,100 | September | 7,620 |
| February | 9,050 | June | 6,290 | October | 7,740 |
| March | 8,210 | July | 11,180 | November | 4,120 |
| April | 9,510 | August | 7,600 | December | 8,990 |

Load-factor, 39 per cent.

Motor Installation.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

| Number | Horse-power | Speed R. P. M. | Application. |
|---|---|---|---|
| 1 | 30 | 900 | Induction motor, direct-connected to a 20-kilowatt, 70-100-volt direct-current generator. |
| 1 | 15 | 900 | Induction motor, direct-connected to a nine-kilowatt, 70-100-volt direct-current generator. |

**Electric Vehicle Garage Data—Sheet No. 2.**

Electric-vehicle garage and repair shop. The motor-generator set operates from 10 p. m. to 5 a. m. every night.

Total connected horsepower, 17. Total number of motors installed, 2. Average kilowatt-hours per month, 596. Average kilowatt-hours per month per horsepower connected, 35.

Kilowatt-hour consumption for 12 months:

| Month | Kilowatt-hours | Month | Kilowatt-hours | Month | Kilowatt-hours |
|---|---|---|---|---|---|
| January | 427 | May | 566 | September | 1,060 |
| February | 339 | June | 266 | October | 659 |
| March | 303 | July | 454 | November | 837 |
| April | 658 | August | 646 | December | 937 |

Load-factor, 7.5 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts. Both motors installed are of the squirrel-cage induction type.

| Number | Horse-power | Speed R. P. M. | Application. |
|---|---|---|---|
| 1 | 15 | 1,200 | Direct-connected to a 12.5-kilowatt 125-volt, direct-current generator for battery charging. |
| 1 | 2 | 1,800 | Belted to a line shaft driving one 3-by-3-inch air compressor; and one emery wheel. This air compressor operates on an average three hours per week. |

Electric-vehicle garage operated by a department store for housing its electric trucks. Ten 1,000-pound delivery wagons are at present charged but an additional order has been placed for five cars. The motor-generator set operates 5 to 6 hours every week night and three-quarters to one hour every noon.

Total connected horsepower, 76. Total number of motors installed, 2. Average kilowatt-hours per month, 2,890.

Kilowatt-hour consumption for 12 months:

| Month | Kilowatt-hours | Month | Kilowatt-hours | Month | Kilowatt-hours |
|---|---|---|---|---|---|
| January | 2,390 | May | 2,790 | September | 3,570 |
| February | 2,240 | June | 2,640 | October | 3,550 |
| March | 3,010 | July | 2,540 | November | 2,070 |
| April | 3,240 | August | 3,860 | December | 2,870 |

Load-factor, 7 per cent; operating-time load-factor, 25 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts. Both motors installed here are of the squirrel-cage induction type.

| Number | Horse-power | Speed R. P. M. | Application. |
|---|---|---|---|
| 1 | 75 | 865 | Direct-connected to a 50-kilowatt 125-volt direct-current generator. |
| 1 | 1 | 1,200 | Belted to a short line shaft driving one tire air pump; one small drill press; and one 12-inch double emery wheel. |

residence rate of 10 cents, with a secondary rate of 6 cents per kilowatt-hour, with five per cent discount for prompt payment. If it is not possible to connect the rectifier through the house meter, an additional minimum charge of $1.00 per month is charged. (2) Rectifiers having an individual meter and rated at five horsepower have a minimum charge of 75 cents per horsepower, or $3.65 total per month; the first 200 kilowatt-hours are charged at 6 cents, the next 200 at 4 cents, and all additional at 3 cents per kilowatt-hour. Discount for prompt payment amounts to five per cent on the first $25.00 and one per cent on the remainder of the bill.

The following data apply to commercial and public garages in St. Louis, Mo.:

| Connected Load, Kilowatts. | Minimum Charge Per Month. | Average Rate Per Kilowatt-Hour for Past Six Months, Cents. |
|---|---|---|
| 4.5 | $ 24.00 | 4.54 |
| 31.1 | 186.75 | 1.85 |
| 63.75 | ..... | 1.90 |
| 25.1 | 33.50 | 2.09 |
| 57. | 133.00 | 2.44 |
| 25.5 | 153.00 | 2.18 |
| 28.8 | 173.25 | 2.09 |
| 10.0 | ..... | 3.01 |

Relative to the equipment for battery charging, the question of suitable apparatus, while not extremely complex, presents numerous questions that must be given serious consideration. The types of batteries ordinarily used are either lead-acid or nickel-alkaline and the supply circuits ordinarily met with are either alternating-current at 110 or 220 volts or direct-current at 110 or 220 volts. In selecting charging equipment for a garage the efficiency must be high, without adding complications, the first cost as low as is consistent with good design and the floor space should be utilized to the best possible advantage. The possible future growth of the garage will make more or larger apparatus and circuits necessary and should be carefully considered.

There is hardly a question as to the advisability of using central-station power, as its economy, reliability and uniformity are well known.

It is very seldom, and then only under the most favorable conditions, that the private or isolated plant can compete in cost of producing current and in reliability of service.

Some valuable data that will be of assistance to the central-station salesman in estimating the equipment for a garage of a given size were given in a paper by Robert E. Hussell before the Electric Vehicle Association of America on October 9, 1912.

In a public garage starting on a small scale a single 30, 40 or 50-ampere rectifier with a wide range of direct-current voltage say 30 to 120 volts will take care of one or two regular customers and a transient car now and then. The 40-ampere size would be the best unless the regular cars require a high charging rate.

The objection to a motor-generator set in a garage caring for not more than three to five cars is that very seldom can all the cars be charged at one time. The motor-generator set should be used at nearly full load to be operated profitably; whereas a mercury-arc rectifier will operate as efficiently at one-half current as at full load. For the garage starting on a small basis the following equipment is suggested for installation, as the business grows it is assumed that the charging rate

of each battery will average about 25 amperes: one 30-ampere, 120-volt mercury-arc rectifier. On adding one or two cars add one more rectifier of the same type, and on doubling the number of cars add one 40-ampere, 230-volt mercury arc rectifier with the charging circuits arranged in series-multiple. This makes a very efficient arrangement and rectifiers are often built with this arrangement. If there is immediate prospect for large increase in business or the Edison battery will be charged to any extent and other batteries are likely to vary in size and in charging current, the following equipment is suggested and should be used in place of the 40-ampere rectifier mentioned, retaining the two 30-ampere rectifiers: (1) one motor-generator set consisting of 15 or 20-kilowatt, direct-current generator, 110 to 125 volts, direct-connected to a suitable-size alternating-current motor of the voltage and phase of the alternating circuit. Usually 2.5 or 3 kilowatts of capacity should be allowed for each of the batteries to be charged at one time.

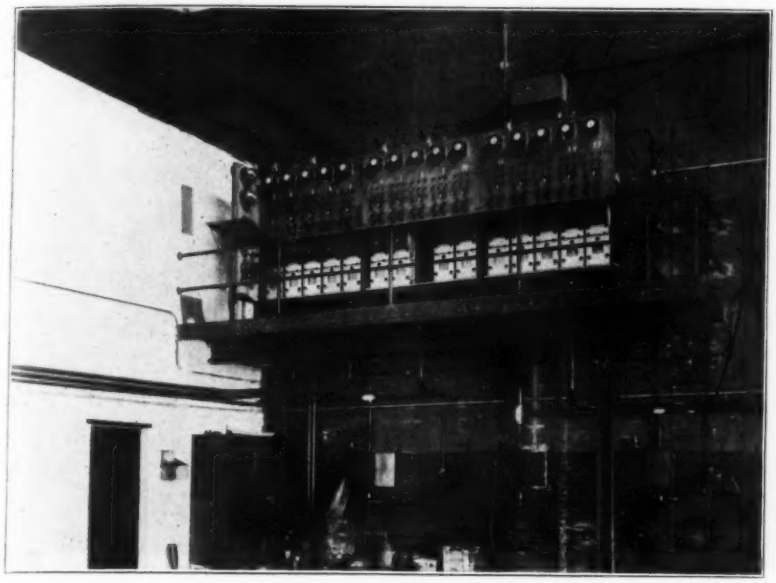


Fig. 4.—Commonwealth Edison Garage, Chicago, with Individual Meters and Charging Panels.

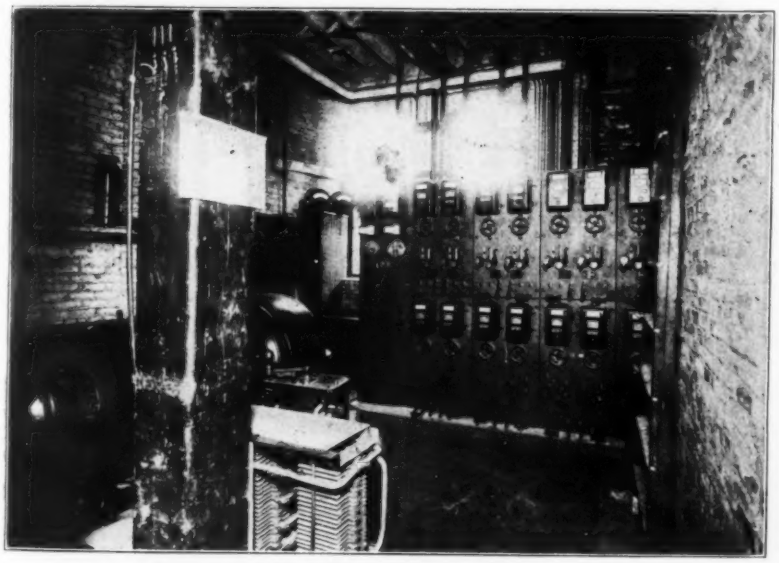


Fig. 5.—Motor-Generator Set and Switchboard in Garage.

(2) One motor-generator control panel, on which should be mounted a voltmeter, ammeter, line-switch, generator field-rheostat, starting compensator for motor and an overload and reverse-current circuit-breaker.

(3 One distributing panel or more depending upon the number of batteries to be charged at a time each designed for six charging circuits. On each panel should be mounted an ammeter, voltmeter, watt-hour meter and means for connecting each to charging circuit. For each charging circuit there should be mounted on the panel a double-pole switch with fuses to protect the circuits. It is also advisable if more than one panel is used to have fuses of ample capacity in the main line going to each panel.

In connection with the watt-hour meter specified it may be stated that the Commonwealth Edison Company of Chicago is urging upon all garage owners the advisability of metering all energy used in charging batteries and to install a separate meter on each charging circuit. One of the accompanying illustrations shows an installation of individual watt-hour meters and is considered as the most modern practice in this connection. The meters, of the direct-reading type, indicate even to those not familiar with other apparatus the exact condition of the charge at all times. Also it gives the garage owner an opportunity to keep accurate accounts of energy consumed in charging and allows him to readjust rates to meet the varying conditions.

With such an equipment it should be possible to garage from 20 to 30 ordinary pleasure vehicles, as very seldom will it be necessary to charge more than one-half of all the cars garaged at the same time. If the charge is completed every time a battery is connected it should be done for the good of the battery if for nothing else.

In selecting rheostats or battery circuits care should be used to get them with large enough resistance and enough carrying capacity. The rheostats should be mounted on top of the distributing panel with which they are to be used. If they are of exceedingly large capacity and too heavy to mount on the top of the panels they should be mounted as near as possible to the panel with which they belong, so that the ammeter can be seen while the rheostat is being adjusted.

If a fairly large motor-generator set is installed it would not be economical to operate it when only one or two batteries are to be charged. To charge these batteries one, two or more 30, 40 or 50-ampere mercury-arc rectifiers should be used. The number of rectifiers will, of course, depend upon conditions. This makes a very economical addition to the garage equipment and many large garages are using rectifiers in this way.

There are many public garages caring for from 20 to 70 cars using mercury arc rectifiers exclusively with very

economical results and where the variation in the number of cells of the various batteries to be charged is large a complete rectifier installation may show greater economy than any other scheme.

In very large garages having motor-generator sets of about 100-kilowatts capacity a smaller-capacity set of, say, 15 to 30 kilowatts should be installed to take care of the lighter loads, as for instance during the daytime, making it unnecessary to run the large set except when nearly full load can be taken from it. This raises the efficiency of the charging plant considerably without introducing any serious complication.

It is very often possible to lower the direct-current voltage of a generator of a large motor-generator set to just take care of the battery having the largest number of cells and gradually raise this voltage as the battery is charged. This will materially reduce the losses in battery-charging rheostats and every saving of this kind of course reduces the cost of charging.

Energy is often wasted by having a large generator to maintain a high voltage to charge one or two high-voltage batteries with a large number of low-voltage batteries on the same line.

For the large or small public garage having from 110 to 125 volts direct current, the charging apparatus consists simply of a suitable number of charging or distributing panels already described and a charging rheostat for each battery circuit. With the exception of not using the motor-generator sets the apparatus will be the same as in the garage having alternating current, the equipment of which has just been described.

Distributing panels with two, four and six circuits are available but if there is no possibility of future increase in requirements the six-circut panel would be the cheapest to buy, even when starting a garage on a small scale. As requirements increase six-circuit panels may be added to take care of the demand and assembled with those already installed to make a complete switchboard.

## Annual Meeting and Banquet of Chicago Section, Electric Vehicle Association.

The annual meeting and banquet of the Chicago Section of the Electric Vehicle Association will be held at the Hotel Sherman on the evening of May 6. In addition to a number of speeches, there will be a vocal and instrumental musical entertainment. Committees have been appointed to get in touch with the various branches of the business interested in the electric vehicle, and it is expected that a large attendance will be present. A prize of one free admission is to be awarded by popular vote to the member preparing the best topical song written to any popular tune. There is much lively competition among the members and there will no doubt be many amusing and interesting contributions.

## Electricity at the Printing Exposition.

The National Printing, Publishing, Advertising and Allied Trades Exposition was held at the Grand Central Palace, New York, from April 19 to 26. There were a number of presses, cutting machines, and similar equipment in operation supplied with power from economical and smoothly running electric motors operated on standard circuits.

Among the companies exhibiting in this connection were the Diehl Manufacturing Company, Elizabethport, N. J.; Sprague Electric Company, Austrich Arc Lamp Company, and the Electrical Testing Laboratories, New York.

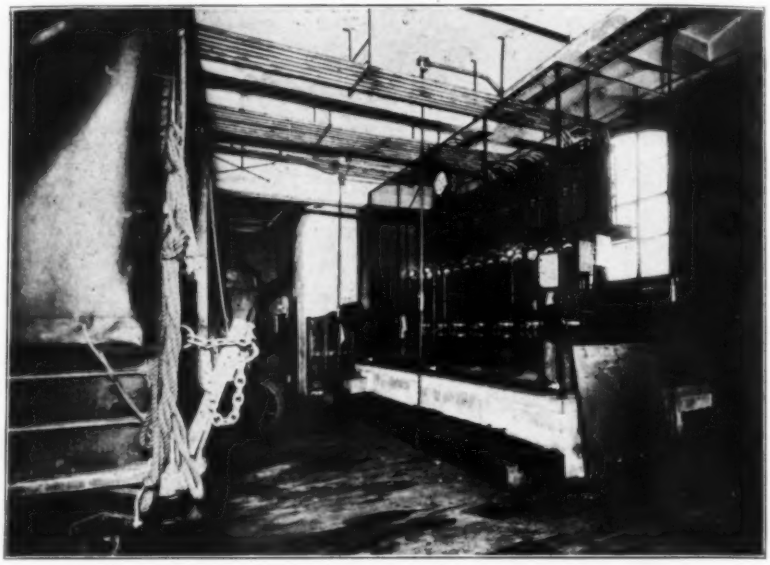


Fig. 6.—Switchboard in Garage of Adams Express Company, Where Direct Current is Supplied.

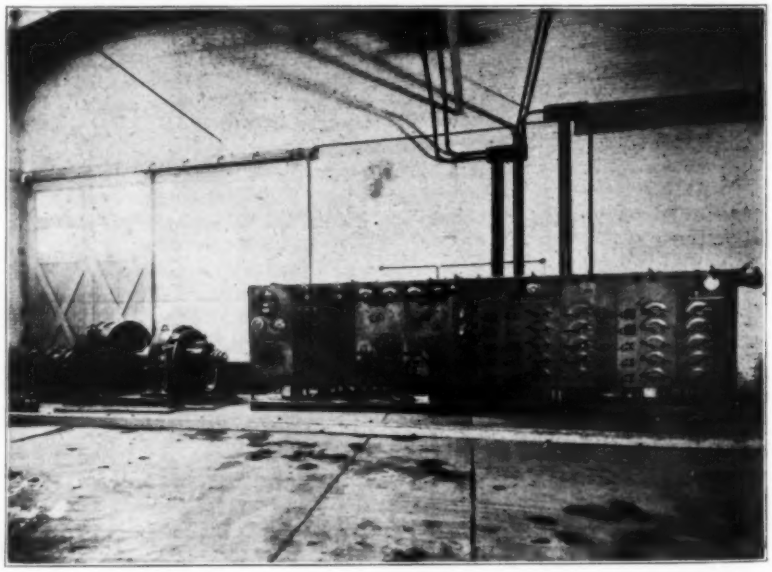


Fig. 7.—Electric Garage of a Large Department Store.

## Electric Fans in the South.

The popularity of the electric fan in the southern cities of this country is rapidly increasing. Now buildings are being completely equipped with them. In 16 modern office and hotel buildings in Texas there are installed over 4,000 electric fans.

# Commercial Practice
# Management, Rates, New Business

## ELECTRICITY AS APPLIED TO MINING FROM A PRACTICAL STANDPOINT.[1]

By J. M. Hopwood.[2]

In view of the fact that the mining industry represents one of the greatest natural resources in the country, it is surprising how little attention is given to some branches of it. I refer particularly to the application of electricity to mining. Electrical activity in this direction is becoming more marked every year. Scarcely a mine of any size is operated without its use, either for haulage, coal-cutting, pumping, or all three combined.

In reviewing the conditions as they exist at most mines, the first thing to take into consideration is the location of the mine and its environment. This is of more importance than it at first seems, as it controls, to a very great extent, the class of labor available. With good skilled labor, under the right management, there is no reason why mechanical and electrical mining apparatus should not be kept in first-class condition. There are very few mines located in what would be considered desirable locations by the average man. They are usually found in out-of-the-way places and little effort seems to be made by the management to compensate for the natural disadvantages.

Conveniences even of the crudest kind are not deemed necessary. Schools, churches and places of amusement that are essential to the getting and keeping of the right kind of men, receive very little attention as a rule, from the coal company. This state of affairs cannot be emphasized too strongly, as the effect it has upon the upkeep of the equipment is very marked. A good man going to a mine situated as I have described, finds a condition which disgusts him. To make any appreciable improvement would be a single-handed accomplishment, and the prospect is usually discouraging enough to warrant his resigning within a few months.

Would central-station power help this condition? I believe it would. The power-house and boiler-house vexations would be practically eliminated. The nine fan engine, which is often the "bone of contention," over which the mine foreman and machine boss have most of their troubles, would be replaced bp a reliable motor, which would operate successfully with the scant attention which causes a fan engine to go to pieces. It would leave only the machinery on the inside to contend with.

### Power House.

Naturally no general description of a mine power house can be given, as they differ very widely and partake of all stages of mechanical and electrical development, from little low-roofed wooden structures, with machinery, noisy, dirty, and out-of-date to modern machinery, embodying every improved detail for the economical generation of electrical energy.

However, these latter installations are far too rare, and since it is with general conditions that I propose to deal, I will choose the inefficient plants, which are unfortunately the more common.

The usual location for the power house is very undesirable and is governed in most cases by the facility with which coal can be gotten to the boiler house, and the result is that the building is erected adjacent to the tipple, where the dust and dirt is excessive.

To form a correct estimate of how much machinery will be required to supply a certain mine is out of the question, as it is impossible to foretell what conditions will be encountered in regard to water, grades, etc. However, with a total disregard for the requirements of the future, the original installation is easy to decide upon. A unit between 100 and 200 kilowatts in capacity is customary. A single-cylinder engine, non-condensing, is the almost invariable selection. It is very seldom that a compound engine, with or without a condenser, is met with around the mines. Provision is usually made for a duplicate installation,and this is about as far as the future is taken care of.

When, a few years later, the lack of power forces itself into prominence, the third machine is a grave consideration. The expense and inconvenience of remodeling the building for its accommodation causes no end of delay, during which time the two machines in operation see mighty hard service. As a rule, good switchboard panels are provided. The circuit-breakers are frequently located at about the middle or bottom of the board and the continual opening of them soon spoils the appearance of it. The wiring about the power house is generally done in a hurry, in order to get the machines running. The intention is, of course, to go over it again and put it in good shape, but *one of the most noticeable features about mine work is that temporary jobs are nearly always permanent.*

The general piping is rarely installed after any approved fashion, and it will be found in most cases to be rather original, and somewhat hard to work around. Pipe covering is an expense that few mines assume; wattmeters and recording instruments also are very seldom deemed necessary. Hence, it is purely a matter of conjecture as to how much current is consumed and what it is costing per kilowatt-hour. A power-house report is another rarity.

The attention bestowed upon the machinery depends upon the personnel of the organization, which in turn depends upon conditions previously mentioned. If a machine shop does not form part of the mine equipment, all repair work resolves itself into replacing old parts, worn slightly or otherwise, with new parts from the factory. In fact this method of repairing is carried on throughout the mine.

Little or no interest is shown in the action of the steam en route from the throttle to the exhaust. I have only met a half-dozen mine men in ten years' experience who owned indicators.

The general condition of the machinery after a few years of operation depends more upon how well it was built in the first place, than upon the amount of care it has received since. To find an engine running with one piston ring, and it broken into a half dozen pieces, should not cause surprise; a piston anywhere from one-quarter to three-eighths inch too small for the cylinder is a common discovery. Very trivial things sometimes cause serious delays. I have on three different occasions traveled fairly long distances on so called "breakdown" jobs,

1 Portion of paper presented at meeting of American Institute of Electrical Engineers, Pittsburgh, Pa., April 19.
2 Master mechanic, United Coal Company.

where a loose eccentric had shut the plant down for a day or more.

During the day the power house is likely to be subjected to severe overloads, but at night a 200-kilowatt machine may have to be kept running to supply a few lights around the office and plant, and a five or ten-horsepower pump in the mine.

Here again the question of central-station power presents itself very forcibly. Instead of keeping all boilers under fire during the night, as is usually the case, and running a large machine at practically no load for twelve hours or more, a small transformer would quietly do the work, while the several firemen and engineers slept on their own time, instead of the company's. It is during this sleepy period that the power-house and boiler-house equipment suffers most. Bearings run hot because the engineer did not wake up at his usual time. Boilers are ruined on account of the fireman sleeping when he should have been watching his water gauge.

### Boiler House.

These two words are so associated in my mind with worry and loss of sleep that I hardly make use of them without feeling that something is going to happen. The average mine boiler plant is equipped with horizontal return tubular boilers, from 100 to 150 horsepower in capacity. Some of the larger and more up-to-date plants have installed the water-tube type of larger size. It matters little what size is used, the conditions will be about the same, as there is no boiler on the market that is proof against bad water, excessive firing, and lack of attention. Boiler-insurance companies look upon mine boiler risks as the worst they have to contend with, and reject more of this equipment than any other.

Any boiler inspector visiting the mining districts will tell you that mine boilers are his greatest worry. The feed-water proposition is perhaps the hardest to cope with and is responsible for most of the troubles met with. Mine water is very often used, streams in mining districts are usually acid, and even the surface water is often the worst possible kind for the purpose. Water-softening plants are sometimes installed, but usually fail in their purpose because the right kind of men cannot be secured to give them the attention they require. Few mines are equipped with reserve boilers, consequently they are fired excessively during the day and only enough at night to keep the steam pressure up to the standard. Repair work is done in a hurry and only when absolutely necessary. A boiler off for repairs usually means trouble for everybody and a loss in tonnage. My experience has been that the repair work done by the mine boiler man has much to do with shortening the life of the boiler.

The feed-water heater may be noticed in passing. Unless the boiler plant is in charge of a good man, this will probably not be cleared out more than once or twice a year. If the plant has been added to, the heater will be found to be a size or two too small, as it is rarely changed to meet the increased installation.

In summing up the boiler situation, it is at least safe to say that 95 per cent of the mines make no attempt to determine the efficiency of the boiler plant. If the fires burn fairly well, the boilers hold water, and the side walls do not fall down entirely, everything is considered to be in good shape. The coal is not measured; neither is the water. The engines are not indicated.

No one knows what a draft gauge would register; no record is taken of the feed-water temperature. A $CO_2$ chart or flow meter would look like child's play. To take 2,000 pounds of scale out of a 150-horsepower boiler with a mechanical cleaner is quite a common occurrence, when such "little things" are considered worth attending to.

With a boiler plant in this condition, mining men still feel themselves able to make power more cheaply than they can purchase it. The only way to convince some of them that they are wrong would be to purchase power from them at the rate the central station is willing to sell it, and see what their receipts are at the end of the year.

### Central-Station Power for Mine Use.

To recommend central-station power as a panacea for electrical mining troubles, would be foolish in the extreme. There are many phases of the business that the source of power would have no direct effect upon. In advocating the use of central-station power, I do so advisedly, as I have had considerable experience with both the central-station and isolated-plant methods.

I do not approve of erecting a large substation at the mine opening and providing for the installation of sufficient machinery to meet the estimated ultimate demand. In order to overcome the transmission losses and do away with the costly and demoralizing effects of low voltage, substations should be built ahead as the workings extend. The cost of heavy feeder cables would be done away with, and also the danger of having them destroyed by falls and wrecks soon after they had been installed. Good voltage could be maintained at the faces in this manner, and men and equipment could work at the top notch of efficiency. The larger pump motors could be alternating-current induction type. This would do away with commutator troubles, which form 90 per cent of the trouble with this class of equipment. Where large pumping stations are maintained in permanent locations, the substation could be located adjacent, and one attendant could look after both. It may also be within the bounds of reason to suggest that since the large pumps are usually worked at night only, the alternating-current pump motor could be used in connection with clutches and drive a direct-current generator during the day.

In some of the larger mining towns, it takes as high as 100 kilowatts to supply the town lighting. The grounded-circuit direct-current voltage is dangerous for this purpose and increases the fire hazard (and incidentally the insurance rate). It is next to impossible to prevent the miners from stealing the incandescent globes. This steady theft represents a considerable expense in the course of a year. With central-station power and a few small transformers, 110 volts alternating could be used for lighting and these troubles done away with.

In considering the question of central-station power for mine use, a decision should not be reached by comparing the relative cost per kilowatt-hour at which the mine can purchase or develop its own power. There are other elements that demand consideration.

(1) How much of the power developed at the mines by 250-volt direct-current generators is put into useful operation, and how much does the line loss represent?

(2) What does it cost the mine to use its own power, when the breakdowns, cost of repairs, and delays due to low voltage are taken into consideration?

(3) The difficulties arising from the mine outgrowing its original installation as compared with a central-station readiness to serve.

(4) The elimination to a great extent of the worry on account of neglect of machinery caused by the scarcity of skilled labor.

## Advertising on Transfers.

Advertising electrical appliances and other features of central-station service upon the back of transfers issued by a street-railway company is practiced by the Lexington Utilities Company, of Lexington, Ky. This company is controlled by the Kentucky Traction & Terminal Company, which operates an extensive local and interurban railway system in Central Kentucky, and has

adapted the back of the railway's transfer for its advertising purposes. Copy suitable for the consumer, particularly for the housewife who is likely to be interested in electric irons and so forth, is used.

## Get the Consumer Interested.

Under this title *The Electrical News* calls attention to the method used in Vernon, B. C., by R. B. C. Hammond, to call the attention of customers to household appliances.

A sheet has been prepared showing the consumption of various household electrical appliances, the period through which they are likely to be required each time they are used, and the cost for that period. These are sent out with the bills every month and are said to be greatly appreciated by all the customers. A power rate of five cents per kilowatt-hour is allowed the users of household equipments when a separate circuit and meter is installed. The list as sent out is as follows:

| Article | Average Consumption | Period of Operation | Cost during that Period |
|---|---|---|---|
| | Watts. | Minutes. | Cents. |
| Chafing dish..... | 400 | 20 | 0.67 |
| Pint milk warmer. | 250 | 6 | 0.12 |
| Quart food heater. | 500 | 6 | 0.25 |
| Coffee percolator.. | 300 | 20 | 0.5 |
| Stove, 6 inches.... | 500 | 15 | 0.62 |
| Stove, 8 inches.... | 800 | 15 | 1.0 |
| Broiler 9 by 12 inches .....1,200 | | 15 | 1.5 |
| Curling-iron heater | 60 | 15 | 0.07 |
| Iron, 3 pounds.... | 250 | 30 | 0.62 |
| Iron, 6 pounds.... | 500 | 30 | 1.25 |
| Frying pan (7 inches) ..... | 500 | 30 | 1.25 |
| Waffle iron ..... | 500 | 12 | 0.5 |
| Tea kettle ..... | 300 | 20 | 0.5 |
| Glue pot, 1 quart. | 300 | 20 | 0.5 |
| Soldering iron, 2 pounds ..... | 200 | 30 | 0.5 |
| Sterilizer .....1,000 | | 30 | 2.5 |
| Bathroom radiator.1,000 | | 30 | 2.5 |
| Heating pad..... | 50 | 60 | 0.25 |

## Special Street Lighting to Aid Fire Department.

A plan has been agreed upon by the selectmen of Lexington, Mass., and officials of the Edison Electric Illuminating Company, of Boston, by which if the fire alarm rings between 1 o'clock in the morning and daylight the company will turn on all the street lights, so as to aid the fire department in finding its way along the streets to the fire. The Edison Company is to be notified by the police department whenever there is a fire.

## Free Renewals of Tungsten Lamps.

The Hartford Electric Light Company has instituted the policy of giving free renewals of tungsten lamps in sizes of 60, 100, 250, 400 and 500 watts. This offer is restricted to one renewal per socket per year. Renewals are not made, however, for the 25 and 40-watt sizes, but a charge of 20 cents each is made for 40-watt lamps and 40 cents for 25-watt lamps.

## Importance of Frequent Line Inspection.

A fatal accident that happened at one of the poles of a 2,200-volt line of an electric light company in a Western city shows the importance of frequent line inspection. The line, consisting of four wires supported on a single cross-arm, with all of the conductors on the street side of the pole, was maintained along a highway. At a curve in the road, one of the poles was guyed to a tree in a neighboring field. About two weeks before the accident, the guy wire became detached from the tree and hung in a vertical position from the top to the bottom of the pole. The wire was harmless as it hung there, and could only become dangerous by being carried out some distance in the street and brought in contact with the live wires. School boys had been in the habit of playing with the hanging wire, and at the time of the accident one of the boys was swinging back and forth on it so far that the wire came in contact with one of the live wires, and he was killed by the shock. The boy's brother was also killed in attempting a rescue. The accident cost the company $4,000. It would not have occurred if the overhead construction had been inspected frequently.

## Rate Research Classification.

The last issue of Vol. II of Rate Research, bearing date of March 26, contains an index arranged alphabetically and also one arranged according to subjects. The latter contains headings not only for articles which have appeared in the volume but also additional headings, serving to make up a complete classification of subjects coming under the heading of rates or closely related thereto. The general classification originally outlined in the first printed issue of Rate Research has been followed, but some rearrangement has been found necessary, and the classification now given will be found better.

## Central-Station Organ Enlarges Its Field.

*Chained Lightning,* of Louisville, Ky., a publication which was originally the house organ of the Louisville Lighting Company, but which is now the property of the Chained Lightning Publishing Company, of that city, is to be distributed to a number of central stations in the near future. The new owners of the publication have decided to make it practicable for use as a house organ by any public-service corporation, and every effort will be made to maintain its standards of interesting news matter, breezy editorials and concise information as to what electricity is doing, embellished with photographs, so as to insure its hold upon the consumer's attention, no matter in what city it is distributed. Open forms for local items of interest, local advertising and so forth will be given along with the regular matter for each issue. It is not improbable that A. T. Macdonald, sales manager of the Louisville Lighting Company, will act from time to time as contributor to *Chained Lightning.* Mr. Macdonald's years of newspaper work and natural skill placed him in a position to make the publication, while it was an exclusive house organ, a medium of distinct value in Louisville.

## Thermostatic Control for Refrigerator Motor.

A thermostatic attachment regulating, according to the temperature within, the operation of a creamery refrigerating plant to a nicety, without any manual attention other than oiling and cleaning the motor on an average of once a week, has been perfected and installed by the Kentucky Electric Company, of Louisville, Ky., in the milk dairy and creamery of D. H. Ewing's Sons, Third Avenue and Breckinridge Street, in that city. The apparatus was designed and installed under the direction of W. D. Meyers, superintendent of installation of the electric company. Relays on the switchboard of a 7.5 horsepower, alternating-current motor operating the refrigeration system are connected with a thermostat in the Ewing plant, and when the temperature within the refrigerator reaches 40 or 45 degrees Fahrenheit, the switch is thrown on and the motor is started. A centrifugal clutch is attached to the motor so that it may start automatically under less than full load.

## Brooklyn Company Gets Important Contract.

The Edison Electric Illuminating Company of Brooklyn has closed the contract for supplying electric power to the big shoe factory of Hanan and Son, at Front and Bridge Streets, Brooklyn, N. Y.; 650 horsepower is required. The Edison service will displace one of the most modern isolated power plants in Greater New York. This plant consists of four Harrisburg-Fleming engines, direct-connected to four Westinghouse generators, and two Sturtevant engines for driving auxiliaries. The shoe machinery is driven by individual motors.

Although considerable live steam is used in the shoe-making process, an investigation covering one year's operation gave results which favored the purchase of electric current.

# Electrical Construction

## ELECTRICAL WORK IN THE BUFFALO GENERAL ELECTRIC COMPANY'S NEW BUILDING.

By Harold L. Alt.

In the heart of the city of Buffalo, N. Y., there has recently been completed a structure of most imposing design and superb architectural treatment. The Electric Building, which is located at the intersection of Genesee, Washington and Huron Streets, is the building referred to. This building was erected by the Buffalo General Electric Company, which occupies the basement, and the first and the second floors, from plans and specifications prepared by Esenwein & Johnson, architects, of Buffalo.

The building consists of three sections—the fourteen-story octagon tower, the four-story Huron Street office section, and the Huron Street storage section, also of four stories. In construction the building is of the fireproof steel-skeleton type, with concrete floors, and, in general, furred-down ceilings. On the top of the tower is placed a searchlight whose beam is visible for twenty miles out on Lake Erie.

The building is lighted throughout with electricity furnished by the Buffalo General Electric Company through their regular service system. The entire electrical equipment was furnished and installed by the Watson, Flagg Company, of New York City. A brief outline of the most important points of the electrical equipment is contained in the following description.

From the point in the transformer room marked "Switchboard" the feeders and subfeeders are run to the various panel boards through conduits and pull boxes, all conduits for the feeders and subfeeders being concealed under the basement floor from the point where the switchboard is located to the riser shaft. The wire for the main feeders and subfeeders is all lead-covered, and all wiring is placed in conduits.

The conduits are run with a maximum of four quarter-bends or the equivalent from outlet to outlet, the bends at the outlets not being counted. The joints in the conduits are made with standard couplings and after the coupling was started on the thread, lead was applied in order to make the joints both air and water tight.

Except in sizes less than one inch in diameter, bending of the conduits was prohibited, all turns or bends being made with standard fittings of the usual type. In the location of the conduits they were kept at least a foot away from all steam and hot-water pipes, and were installed without strings, wires or any other means of drawing in the conductors. After the building was completed the conductors were installed, a snake or fishing wire being used, and on long or difficult runs matters were helped along by the use of powdered soapstone in the conduit as a lubricant.

The floor receptacles and plugs consist of a box similar to the General Electric No. 75940, complete with a Hubbell receptacle and extension plug. These boxes are galvanized, and are used without the receptacle wherever floor outlets are provided for table or desk use, the cover of the box being tapped for half-inch conduit in these cases. At the points where the floor outlets for lights, telephones or bells are bunched together, gang floor outlets are used, with one apartment for a light receptacle and one for 'phones and bells. All the floor boxes are set absolutely flush with the finished floors and have square brass plates.

For the wall outlets of the flush type No. 5418 Hubbell flush receptacles, with brass-covered caps are installed. The ceiling outlets, except in the corridors and main lobby, are provided with fixture hangers of half-inch pipe. For the outlets in the main lobby the hangers are

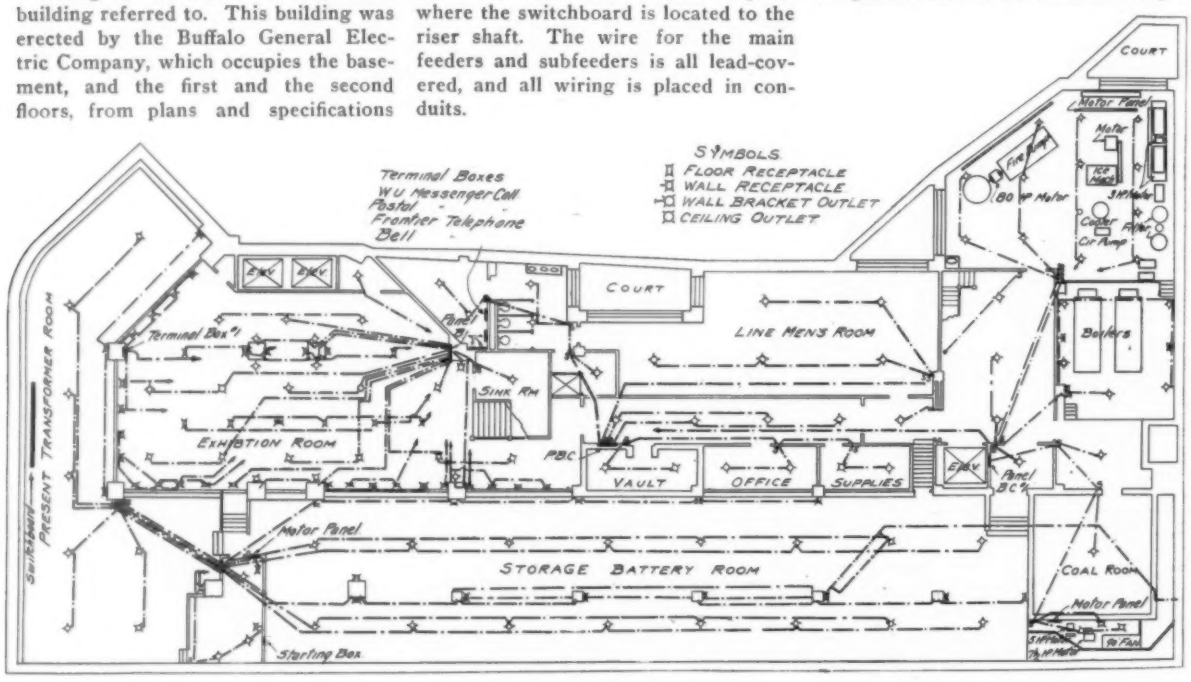



Fig. 1.—Basement Wiring Plan.

made of pipe 1.5 inches in size, while for the corridors three-eighths-inch pipe is used. The hangers are made up of galvanized pipe and tee fittings with 12-inch arms. For the side outlets in the main lobby and exhibition room, special hangers of inch pipe are installed, which are fastened to the steel columns.

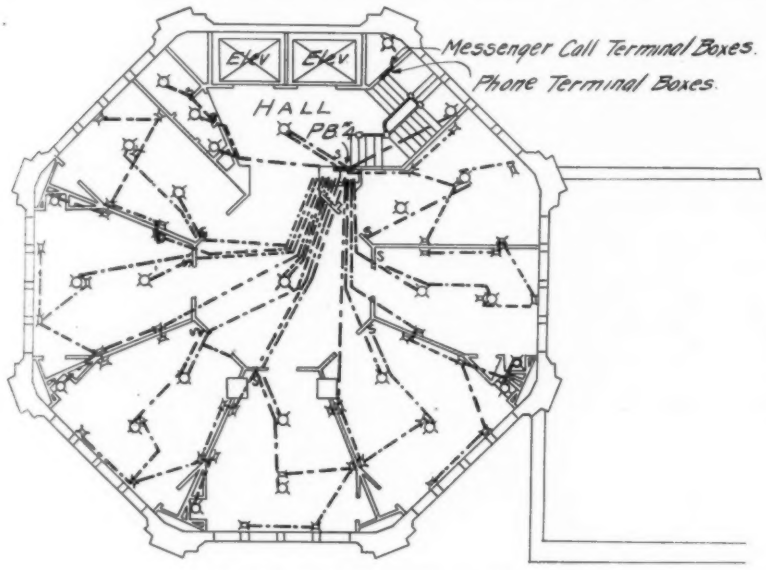



Fig. 2.—Fourth-Floor Wiring Plan.

Typical wiring plans for various floors are shown in Figs. 1 to 4. Wires of No. 8 B. & S. gauge or smaller are solid conductors, but all wires of No. 7 gauge or larger are stranded, the solid wires and the strands of the rubber-covered cables being tinned. The cables are composed of the following number of strands:

No. 4 cable and smaller, 7 strands.

No. 3 to 0000, inclusive, 19 strands.

No. 0000 to 500,000 circular mils, inclusive, 37 strands.

No. 500,000 to 1,000,000 circular mils, inclusive, 61 strands.

Over 1,000,000 circular mils, 91 strands.

For making the joints in stranded wire a tinned copper sleeve was used having a cross-section equal to that of the cables; these sleeves are six inches long for No. 0 B. & S. gauge and smaller sizes, and 10 inches long for the larger cables. They were made small enough to hug the cable with a close fit, and have two soldering holes into which the solder was poured with a ladle until the sleeve was completely filled. Dossert connectors with a cup terminal to receive the branch were used in making taps on to stranded cables. No more than one circuit was installed in any one conduit.

The thickness of the lead covering for wires and cables was made three-sixty-fourths inch for No. 14 wires to No. 8, inclusive; one-sixteenth inch for No. 6 to No. 1, inclusive, and five-sixty-fourths inch for No. 0 to 600,000 circular mils. Where joints or taps were made in the lead-covered cable a lead sleeve of the same thickness as the lead casing was used, which was first slipped over the wire or cable, and after the wire joint was made and insulated, the sleeve was slipped down over it and a regular plumber's wiped joint made between the sleeve and the casing.

The panel boards, both slate and marble, are built up of double branch circuits mounted on sectional panels and connected to the main busbars in such a manner as to allow the removal of any section without disconnecting the main busbars, which are three in number and which are located on the rear of the panel. Large switches and sets of fuses are mounted on individual panels. All the circuits are fitted with National Electrical Code fuse holders of extra heavy hard spring metal.

The sectional panels for the marble panel boards are composed of blue Vermont marble, which is highly polished and about three-fourths of an inch thick, with the edges beveled. The frames around the panels are made of the same material, of about half an inch in thickness, each side of the frame being in one piece and supported every 12 inches. The slate panel boards are quite similar in design.

The panel boxes are of iron about one-eighth inch thick, and are galvanized. They are constructed with angle corner irons and braces which are carried around

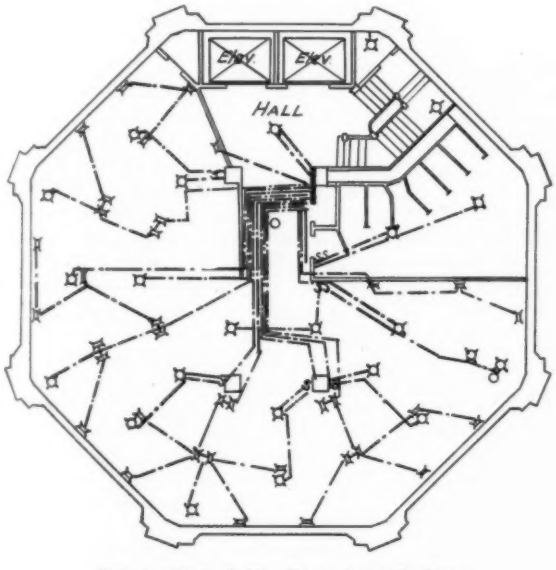



Fig. 3.—Plan of Circuits on Seventh Floor.

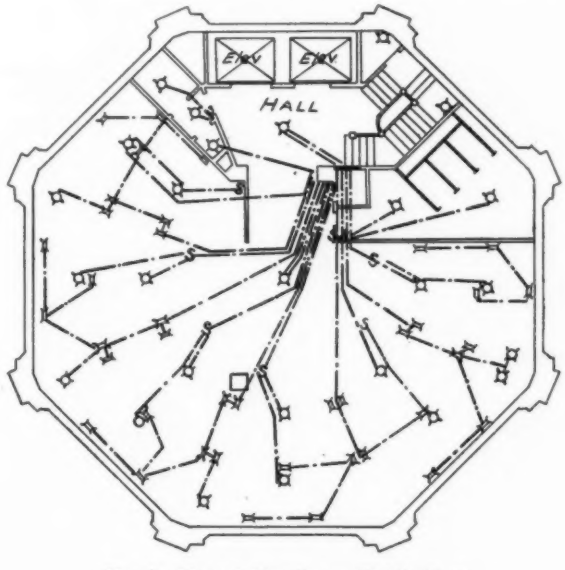



Fig. 4.—Plan of Circuits on Eighth Floor.

the four sides of the box in both front and rear. The portion of the box in the rear of the panel is lined with quarter-inch slate. Where these boxes have iron trim and doors, one-eighth-inch material is used, trimmed with moldings and corner squares, the doors being fitted with brass hinges 12 inches on centers; they are provided with lock and key and have a heavy catch with ring handles. On the outside the doors and exposed trim have a finish of black, hard-baked enamel.

Where brass trims and door frames are used these are made of cast brass and rigidly reinforced to prevent warping. The panels of the doors are extra heavy French plate glass, with half-inch bevel, and where the doors are more than 18 inches wide they are made in two sections.

There is a circuit-breaker panel on the fifteenth floor, which is made of blue Vermont marble 24 by 36 inches in area, and 2 inches thick, supported on a pipe frame fastened to the wall and floor. Upon this panel are mounted four, 100-ampere, type C, form C R., double-pole, 250-volt, General Electric circuit-breakers. All the busbars and connections are placed on the rear of this panel.

On the fourteenth floor a terminal cabinet is located. This is made of one-eighth-inch iron, and constructed in a manner largely similar to the panel boxes; the cabinet is about 36 by 24 by 6 inches in dimensions, and is divided into three sections, each of which is lined with quarter-inch slate, the divisions being formed with one-eighth-inch iron. In Section No. 1 is mounted a 100-ampere, two-pole, 500-volt switch; in Section No. 2 a similar switch for 220 volts; and in Section No. 3 a 100-ampere, three-pole, 220-volt switch. Each section is provided with hinged doors and the bottom portion of the gutter of each compartment is hinged and is provided with bushed holes corresponding in number to the number of poles on the switches.

The panel board main bars and terminals are large enough for a load of 50 amperes, and all branches for a load of 20 amperes, while the joints feeding the double branch bars are good for a load of 30 amperes or for 15 amperes on each at one time. All the main and branch bars have fuse attachment for National Electrical Code fuses, and all metal work is polished and covered with four coats of lacquer.

The knife switches are proportioned for the same current densities as the distribution and panel boards and have all conducting metal parts made of copper. The knife switches throughout have as many blades as there are wires or cables to be broken.

All switches are plainly marked showing what circuits they control, the knife switches, except those in the junction or distribution boxes, being provided with a bevel-edged brass plate either above or below with the circuit indicated upon it. The knife switches in the junction and distributing boxes have the number of the circuit stamped on the busbar opposite the switch and a list is placed on the inside of the door of each box to indicate the respective numbers of the various circuits and of what they consist.

## Convenient Outlets for Bedroom.

Very little care and attention is given to the placing of electricity in the bedroom. Apparently the contractor just sticks a wall fixture in wherever it is most convenient and the occupant of the room has to make the best of a bad job. Just as often as not the electric light is located up against the wall where it ought not to be.

Not only is it important that the electric light for the bedroom be located where it is most convenient, but other outlets should be provided in case an extra lamp is desired during sickness, or for reading purposes. Now and then auxiliary electric devices, such as the small electric iron, the electric fan, the electric shaving mug, the electric luminous radiator, are desired, and where only one outlet is provided the lamp has to be taken out whenever anything else is used.

An electric shaving mug is very serviceable in homes where hot water is not always on tap and in connection with the shaving mirror it is quite handy to have an electric light that may be adjusted to render its best service. The electric curling iron and the electric hair dryer appeal very strongly to the ladies of the house, the former having distinct advantages over the curling iron which has to be heated by gas, with the accompanying soot and danger of excessively high temperature. Fans, ozonators, radiators and other common devices may also be wanted in this part of the house.—*Southwestern Electrician.*

## SOME INTERESTING WIRING FOR CIRCUIT-BREAKER CONTROL.

By John G. Montgomery.

In a plant where the writer is employed the equipment includes a number of direct-current generators, each one of which is direct-connected to a synchronous motor. In starting up any one of these units, we bring the motor up to synchronism by using the direct-current end of the unit as a motor, after which the synchronous motor is thrown upon the source of alternating-current supply and the direct-current generator connected in multiple with the other direct-current machines already running. Where such operation as this is employed it is generally necessary, particularly if the machines are large ones, to provide safeguards against excessive speed during the process of synchronizing. This safeguard, in the plant in question, consists of a sort of a centrifugal switch mounted on the shaft of the machine to be protected, similar to the switch sometimes installed on rotary converters that are to be used to convert direct current into alternating-current power. The arrangement is such that if the speed becomes excessive centrifugal action closes a switch which short-circuits the no-voltage release of the circuit-breaker on the direct-current side of the unit, and thus causes the power to be cut off automatically.

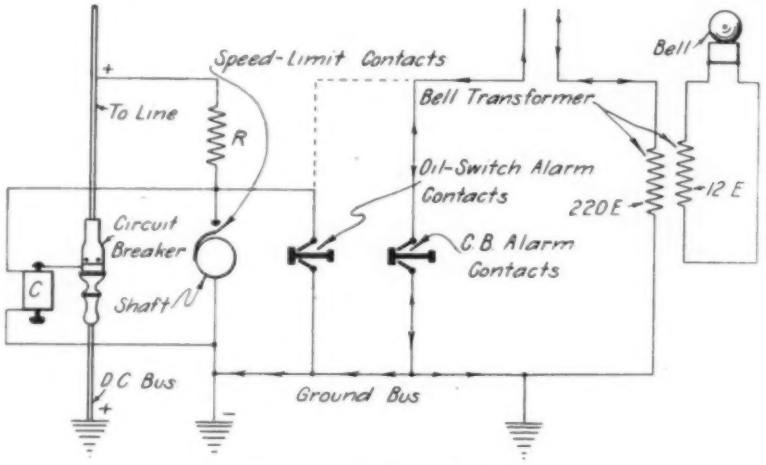



Fig. 1.—Arrangement of Circuits.

Each one of the synchronous motors that we use is connected to the line through an automatic oil switch which is supplied with the usual bell to give the alarm in case the switch opens. Those who are familiar with power-plant operation know, of course, that the ringing of the alarm bell results from the fact that, as the oil switch flies open, a pin or bar on the switch

mechanism closes a gap in the alarm-bell circuit.

In our plant considerable trouble arose from rather frequent failure on the part of the attendant to hear the alarm bell when an oil switch would open. Thus it would happen that a unit would be left with the direct-current generator running as a motor and pulling the synchronous motor running on open circuit. Finally, we removed this source of trouble by wiring the circuit-breakers in such a way that the opening of the oil switch would shunt the current around the no-voltage release of the direct-current circuit-breaker and cause it to open, thus cutting off the direct-current power. A diagram of the connections is shown in Fig. 1. Here the no-voltage release coil is marked *C*. The bell circuit, shown by broken line, is eliminated, and it is simply a matter of connecting the oil switch contacts in parallel with those of the speed-limit contacts, as shown in the diagram, in order to have the direct-current circuit-breaker to open whenever the alternating-current oil switch is released or opened.

## Value of Insulation Tests.

It is easy to exaggerate the importance of meager readings when testing a new wiring installation, according to a writer in the (London) *Electrical Times*. It by no means follows that a high reading in megohms implies a specially safe installation, or that a low reading points to defective work and poor insulation. He has seen tests taken in suburban houses, in which the wires run bare beneath the boards and inside the lath and plaster partitions, and are only inclosed in slip-joint conduit when buried in plaster, the wires pressing hard on the jagged edges. And these tests may at the moment give a very high insulation resistance. On the other hand, a test of a screwed-conduit job, properly carried out with good-grade cable, may give a very poor reading if tested before the insulation has had time properly to dry out. If both classes of work were tested six months later, very different results would be recorded. In the former case damp may have affected the unprotected wiring, leakages from the cheap flex to fittings and across common lampholders and switches may have taken place, and the unbushed ends of the conduit may have pierced more or less the insulation of the cables, and the insulation resistance would have dropped proportionately. In the latter case the job would have dried out and the insulation resistance would have risen by many megohms and would not be likely to drop materially for years to come, it is asserted. The chief advantage of a test immediately before the circuits are connected to the supply system is to discover faults and grounds.

## Another Outlet Box for Concrete Work.

The installation of conduit work in concrete floors is a subject never lacking in interest among electrical contractors. Evidence of this was seen in the comments elicited by recent notes on the subject in these columns. It will be recalled that one contractor was disposed to question the advantage of a ceiling-outlet box

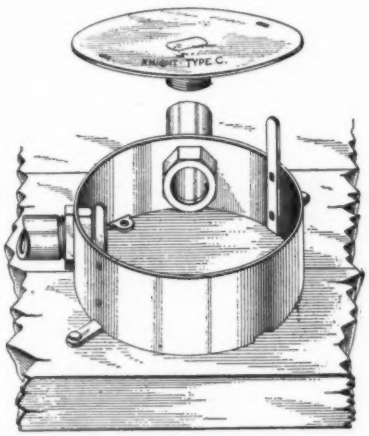



Fig. 1.—Box Attached to Wooden Form, With Cover Removed.

with a separable cover or bottom for use in concrete floors. He contended that the proper way to install a box in such a floor was to put the bushing on with the box inverted, the locknut having first been run on the conduit further than its final position, and then to turn the box over and screw the locknut up tightly against it, after which the box was to be nailed in place on the wooden form.

A criticism of the above method of installation is suggested by the accompanying figures. If the outlet is at one end

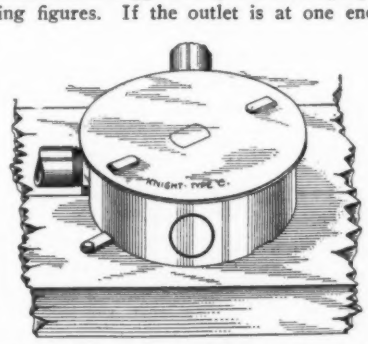



Fig. 2.—Box With Conduits and Cover In Place.

of a run of conduit or somewhere in a straight run, the method would seem to be a good one; but where two conduits leave the box in any other way than in approximately the same straight line—see Figs. 1 and 2, for example—the method would probably not prove very practicable.

The fitting shown in the accompanying cuts is the Knight type C outlet box, which is manufactured by the J. Gordon Knight Electric Company, Incorporated, 43 Fulton Street, New York. In the installation of this box on the wooden form employed in the erection of a concrete floor, the box is first fastened in place with nails driven through lugs outside the walls, after which the interior is made accessible by the removal of the cover. When the conduits have been inserted and the bushings and locknuts turned up tightly, the cover is replaced and fastened on by means of the lugs provided for the purpose and shown in the cuts. Another interesting fact concerning this outlet box is that the fixture stud is embodied in the cover itself. It is stated that this provision was made because it was found that the alkali in the concrete often destroyed the threads on the bolts or screws when the stud was attached in the usual way, and allowed the weight of the fixture to be transferred to the conductors.

## Enameled Bell Wire.

The makers of enameled wire have evidently overlooked the fact that either black or red enameled wire makes an ideal bell wire. Aside from certain minor advantages, it is moisture proof, making it superior for damp places or cellars. It is also inert to the common chemical reagents, making it useful for places exposed to fumes, etc. The most important property, however, is its neatness. It requires very little space, moreover, and its suitable for exposed wiring. In many cases, either the red or black wire will very nearly match the wall paper and decorations, and in most cases will lie so close to the wall that it will scarcely be noticed. It should find considerable use in wiring expensively decorated rooms in old buildings, etc.

In some tests made by the writer, it was found that the thin enamel withstood the abrasion and wear necessary in handling the wire very well. Two conductors were placed under the same staple without short-circuiting. The staples were plain; insulated ones would be better. The wires in this particular job have now been in service for more than a year without repairs of any kind.

In another test, five conductors were twisted into a cable and installed in a bell system. The cable was fastened with insulated staples. There was a material saving in space, as five ordinary wires make a rather bulky cable when twisted together.

In using the enameled wire, care must be taken in scraping the terminals for connections. All the enamel should be taken off at the terminal without cutting into the wire, as the wire breaks easily when nicked. The joints should be painted with liquid insulation. Some unpainted joints exposed to sulphuretted-hydrogen fumes were great-

ly weakened in a very short time. As in the case of cotton-covered wire, kinks and bends should be avoided. The enamel has an advantage in that the breaks are not hidden in the insulation. The insulation is of a nature which makes the detection of breaks very easy.

The cost per pound is about the same as for common bell wire, but enameled wire has greater length per pound. Philip Edelman.

## Among the Contractors.

The Wolverine Electrical Construction Company, of Chicago, has been awarded contracts for wiring three large buildings in that city within the last few days.

The contract for the electric wiring in the Woman's Building at the Illinois State Normal University, at Carbondale, has been awarded to the Caldwell Electric Shop, of Champaign, Ill.

E. A. Emery, of Galva, Ill., has secured the contract for the electrical work in the new Henry County Infirmary located near Henry, Ill., the contract price being $1,650.

The White City Electric Company, of Chicago, has been engaged to install the circuits for 500 incandescent lamps in the Brooks Building in that city.

The Gem City Electric Company, of Quincy, Ill., is doing the electrical work in the Empire Theater, in Quincy. This is a modern job of wiring throughout. In addition to its large contracting business, this company carries a complete line of electrical supplies. Business is reported to be good.

The United Electrical Construction Company, of Chicago, will do the electrical work in the Normal Arts School in that city. There will be 1,200 incandescent lamps and 21 electric motors.

By order of the Circuit Court a receiver, under a bond of $10,000, was appointed for the W. S. Rosenfeld Electric Company, of Baltimore, Md. The appointment was made upon a petition of W. S. Rosenfeld against his business partner, Isidore C. Bernstein. Irreconcilable differences between the partners is given as the reason for the action.

The Whitman & Barnes Manufacturing Company, of Chicago, has awarded a contract to Freeman, Sweet & Company, of that city, for the installation of 50 electric motors in its plant. The aggregate capacity of the motors will be nearly 1,000 horsepower.

The Central Tube Company, of Minneapolis, has been awarded the contract for installing the conduits for the new ornamental street-lighting system on Pine Street and on Third Avenue in Hibbing, Minn. The Home Electric Shop, of Hibbing, was awarded the contract for installing the concrete bases for the lamp standards.

The Wentworth-Dean Electric Company, of Lima, O., has the contract for wiring and fixtures for 125 new dwellings being erected by the Home Realty Company. This company is also remodeling the wiring and installing the electric plant in the Lima High School and doing the wiring in the new Allen County Savings & Loan Building, all of these jobs being in conduit and of high-class construction throughout. The Wentworth-Dean Company is also installing 115 horsepower in motors in the stone quarry of the Lima Stone Company, to supplant the company's present steam plant.

The Wilson-Maltman Electric Company has been awarded the contract for equipping the Polytechnic Institute of Baltimore, Md. This contract, no doubt, is the largest ever awarded in Baltimore with close competition. Walter E. Hill tendered the next lower bid and protested the award, which was made upon the recommendation of a special committee composed of Building Inspector Stubbs, City Engineer McKay and Lieutenant King, principal of the Polytechnic Institute.

Friends of William Dennison, general manager of the Newberry Electric Company, St. Louis, Mo., are having some fun at his expense over an alleged venture of his in the matter of buying a farm. They insist that the farm was purchased without having been seen. The accompanying photograph shows Mr. Dennison and a bunch of his St. Louis friends, said to be searching for the piece of real estate after the transaction.

Reading from left to right the group shown in the photograph consists of Edward Koeneman, president of the Koeneman Electric Company; "Big Bill" Koeneman, president of the Guarantee Electric Company; J. P. Casey, manager of city sales, Western Electric Company; William Dennison and Charles J. Briner, president of the Briner Electric Company. It is stated that Mr. Dennison purchased this farm, which was supposed to be located at Tip Top, about 1.5 miles from Hogan, down in the beautiful valley of the Ozarks, from an enthusiastic salesman who described it as an ideal location for a "hangora-goat ranch" and the one place on earth to hang out the motto "'Ome, Sweet 'Ome."

A Group of St. Louis Electrical Contractors.

The photograph was taken below the timber line, our correspondent asserts, and does not show the boulders that some antediluvian had carelessly rolled upon the ranch when he hauled away the soil in anticipation of the time when Mr. Dennison would make the purchase. After having examined his property the purchaser decided he would endeavor to interest the land company in some kind of an electrical wiring proposition in order to get even. The natives and friends of his included in the photograph when they had seen the newly purchased property presented him with resolutions urging upon him the necessity of investigating the transaction immediately in order to prevent the conveyance of 800 acres instead of the 80, which he had actually bought.

# National Association of Electrical Inspectors.

THOMAS HENRY DAY, president, 59 Deerfield Street, Hartford, Conn.
H. S. WYNKOOP, vice-president, 13 Park Row, New York, N. Y.
WILLIAM LINCOLN SMITH, secretary and treasurer, Concord, Mass.
JAMES E. COLE, Representative on Electrical Committee of National Fire Protection Association, 11 Wareham Street, Boston, Mass.
J. E. LATTA, assistant secretary, 608 South Dearborn Street, Chicago, Ill.

*Executive Committee:*

EUGENE N. DAVIS, chairman, Brookline, Mass.

Frank R. Daniel, R. P. Strong, Henry A. Knight, C. H. Fletcher, Washington Devereux, James B. McCarthy, James H. Fenton, R. J. Forsyth, C. W. Mitchell, A. W. Hopkins, G. W. Perry, George L. Collison, T. H. Fritts, A. H. Soper, T. W. Bowry, F. G. Hartwell, A. A. Moffitt, Thomas D. McColl

## Secretary's Message.

The members of the Association have seen the abstracted reports of the New York meetings which have already appeared, including the substance of the secretary's report. I shall shortly send the financial report to each member, together with whatever other matter is necessary.

At this time I desire to call the members' attention to the make up of the new Executive Committee. It has been increased to nineteen members. James Bennett, our vice-president, having become an associate member, H. S. Wynkoop, the former chairman of the Executive Committee, was elected vice-president in his place, and J. E. Latta, associate editor of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, was made assistant secretary.

James S. Meade, of Philadelphia, who had also become an associate member and who had very little time to give to the work, has retired from the Executive Committee.

The new members of this committee are: Eugene N. Davis (chairman), superintendent of wires, Brookline, Mass.; C. H. Fletcher, city electrician, Vancouver, B. C.; James H. Fenton, electrical engineer of the St. Louis Fire Prevention Bureau; R. J. Forsyth, electrical inspector for the Greenfield Light & Power Company, Greenfield, Mass.; A. W. Hopkins, inspector of wires, Springfield, Mass.; G. W. Perry, inspector of wires, Hartford, Conn.; A. H. Soper, inspector for the Hartford Electric Light & Power Company; T. W. Bowry, city electrical inspector, Richmond, Va.; F. G. Hartwell, electrician of the Massachusetts Institute of Technology, Boston, Mass.; Andrew A. Moffitt, inspector for the Providence Insurance Association, Providence, R. I.

The other members of the committee are well known to the members of the Association. This gives us, including the elected officers, 24 men to submit replies to questions asked in this department.

I may be permitted to quote for the benefit of members the second section of our Articles of Association:

"The object of this Association shall be the promotion of uniform interpretation and enforcement of rules governing the installation of electric wiring and apparatus; the securing of a better and more uniform standard of electrical construction; and the dissemination of information and correct practice among its members."

This, it will be seen, is broad enough to give us all something to do, and this department of questions and answers was designed as a means of furthering the objects indicated above. This it can accomplish only provided the members, and all others interested in the above objects, will keep the secretary supplied with questions, not only on the interpretation of the Code, but questions which fairly come under the article quoted above. And provided also that the members of the Executive Committee will do their share in answering carefully and promptly the questions sent out and returning them as soon as possible to the secretary. That this may be done, the secretary is sending with each bulletin to the members of the committee addressed and stamped envelopes in the corner of which is printed the title of the matter contained and the name and address of the member. The secretary desires that every thing possible be done to make the work of the Executive Committee easy, and in return hopes that the questions will appear in quantity and that the replies will be kept up to date. If this is done, then he hopes that matter under this head may appear in each number, the first week three questions with half the replies, the second week the remainder of the replies to these same questions, the third week three more questions, and so on.

It must be remembered that this publication must appear on time and so must go to press on a definite day, and if material is not on hand well ahead of time, the secretary cannot get it into shape and forward it to Chicago without irregularity in its appearance. The labor is perhaps not in itself excessive, but when it has to be fitted in with all the other calls upon one's time in the regular work of the office it amounts to considerable.

As I have said before and may repeat, I feel certain that the members must keep coming across little incidents humorous or serious in the day's work which would interest the others and lighten up the printed matter, on the one hand, or, on the other, give it an added interest on the practical side. If you will only do your part and send any such matter along, I will try my best to do mine as acceptably as I can.

**The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.**

**It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.**

**The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.**

### Bushings for Outlet-Box Covers.

**Question 226. In installing cord pendants hung from outlet-box covers, should the bushing of the cover be of approved insulating material or of metal: (a) When ordinary flexible cord is used? (b) When reinforced cord, crefield or canvasite, or circuit wire is used?**

Answer 1 (R). Rule 59 *c*, second paragraph, states that insulating bushings must be provided to insulate each wire separately, except for flexible cord, for which only one insulating bushing is required. This answer applies to both (*a*) and (*b*).

Answer 2 (U). I think this matter is covered by Rule 59 *c* of the Code. Fittings which are designed for bringing conductors from metal conduits to exposed wiring must be provided with non-absorptive, non-combustible insulating bushings, which, except with flexible cord, must separately insulate each conductor.

Answer 3 (H). There seems to be no Code provisions covering the exact point raised in this question, and the matter resolves itself into a question of individual judgment under the circumstances. I do not believe in using cord pendent from the outlet box with the cover on; if this must be done, the cover should be bushed with approved insulating material for ordinary flexible cord. Reinforced cord, crefield or canvasite, or circuit wires might safely be brought through a smooth hole in the box cover.

Answer 4 (B). The bushing of the cover, to conform with Code requirements, should be of insulating material. This applies to both sections of the question.

Answer 5 (V). Fittings which are designed for bringing conductors from metal conduits to exposed wiring must be provided with non-absorptive, non-combustible, insulating bushings, which, except with flexible cord, must separately insulate each conductor. In the use of flexible cord both conductors may come through the same bushing. See Rule 59 *c*.

Answer 6 (O). Rule 30 *a* covers the installation of fixtures, and in the absence of any specific definition, the word "fixtures" as used in the Code must be taken to include any device, appliance or contrivance used to support, hold or carry lamp sockets, etc. From Rule 30 *a*, we get the general principle that for conduit systems the insulation of conductors in fixtures must be equivalent to the insulation in other parts of the system, or else the fixture must be separated from ground by insulating joints, etc. In this case the outlet box cover, or its bushing supporting the flexible-cord pendant, is in effect a fixture and must comply with Rule 30 *a*, in so far as it applies. If the flexible cord has an insulation less than three-sixty-fourths inch in thickness, the knot called for by Rule 32 *g*, if resting upon a metal bushing, would be in violation of Rule 30 *a*, assuming that the outlet box is a part of the grounded conduit system. If a porcelain bushing be used, however, ordinary flexible cord may be employed and the splices so disposed and supported that the insulation between the conductor and ground will be the equal of that between wire and conduit. Experience has shown that where fixture wire or flexible cord is allowed to come against grounded metal in outlet boxes, it is almost impossible on the average installation to secure and maintain the insulation resistance called for by Rule 88.

Answer 7 (F). Rule 23 *f* states that insulatings bushings must be used to protect flexible cords where entering sockets.

The reason for this is to provide a smooth insulating material at the point where cord would have a tendency to wear against the metal of the socket.

With reference to flexible cords passing out through outlet-box covers, there is no specific rule covering this subject, but as the wear at this point is just as great as at the socket the same type of bushing as specified in the above rule should be used. This applies to both (*a*) and (*b*).

Answer 8 (P). Insulating material in (*a*); either metal or insulating material in (*b*).

Answer 9 (S). I find that Rule 59 *c* of the Code answers this question. I should not make exceptions as to the kind of flexible cord used.

Answer 10 (E). I believe that pendent cords, except those having a metal armor, hung from outlet boxes, should be protected if the cover of the box be metal by a bushing of approved insulating material. This would also apply to the use of the circuit wires, when used as pendents. There is no specific rule in the Code for this, but the requirements of Rule 32 *f*, "Must be protected by insulating bushings where the cord enters the socket" would apply, for practically the same reason that makes the bushing in the socket a necessity, namely, the protection of the wires against possible abrasion.

### Insulating Joints and Canopy Insulators in Canopies Having Pendent Lamps.

**Question 227. Where a hickey is placed in an outlet box and carries a short brass stem which, in connection with a canopy, forms an ornamental outlet for a cord pendant, may the insulating joint and canopy insulator be omitted: (a) Where an ordinary flexible cord is used? (b) Where reinforced cord, crefield or canvasite, or circuit wire is used?**

Answer 1 (I). Both sections of this question, it seems to us, must be answered in the light of Rule 30 *a*, National Electrical Code. Reasons for requiring insulating joints and canopy insulation at all on lighting fixtures are suggested in the last sentence of the first paragraph of this rule. One of these reasons is, for example, that if a fixture is not insulated from the ground, and an accidental ground should occur on one side of the line at some other point than at the fixture, then there would be great danger of the other side of the line breaking down to earth within the fixture or within some lamp socket. In short, the aim of Rule 30 *a* is to prevent any strain to ground on the insulation of the fixture wires, since, in general, these wires are not able to stand great strain. Circuit wire of an approved quality is able to withstand the strain of ordinary service, however, and hence in the case considered in the question we should not ask that insulating joints and canopy insulators be used if the pendent were made of wire of this kind. But we would insist on the insulators if flexible cords were used, and, as we have already intimated, we would cite Rule 30 *a* in explanation of our ruling. With crefield and canvasite we have not had any experience.

Answer 2 (E). If in the instance cited in this question, it should be a combination outlet and a metal or a metal-lathed ceiling, I would suggest that the insulating joint and canopy insulator be used. If, however, it were a straight electric outlet and the tube extended to the lower side of the canopy only, then the joint and canopy insulation might be omitted. Many fixture hangers, for purpose of appearance, install a short stem in the hickey and support the canopy with an insulating bushing on the end of this stem. For general work, however, I think it best to follow the requirements of Rule 30 *a*.

Answer 3 (F). I would consider a canopy so installed as being an outlet-box cover and not a fixture, so would not require insulating joint and canopy insulation. This applies to both (*a*) and (*b*).

Answer 4 (S). There is no rule in the Code which will cover this question. I would approve cord pendants installed in this manner.

Answer 5 (N). I should not con-

sider this a fixture but rather an ornamental cover. I should require an insulating bushing for ordinary flexible cord; with reinforced cord or canvasite I would allow a metallic opening properly smoothed and rounded. If circuit wire were used, the Code would require separately bushed outlets. I suppose circuit wire means 600-volt, No. 14, B. & S. gauge wire.

Answer 6 (P). No, to (*a*). Yes, to (*b*); if the insulation of the cord, etc., "is the equivalent of insulation in other parts of the system, and provided that approved sockets, receptacles or wireless clusters are used of a type having porcelain or equivalent insulation between live metal parts and outer metal shells, if any."

Answer 7 (O). There is no essential difference between this question and Question 226; the same discussion applies.

Answer 8. As the cord must pass through this stem it must be insulated as called for in Rule 30 *a*.

Answer 9 (H). Such an arrangement as described in this question would form a fixture under all conditions and should be protected with insulating joint and canopy insulator.

Answer 10 (B). If the circuit wire is carried through an approved stem into the socket, insulating joint and canopy insulator may be omitted; otherwise the Code would require their use.

### Poorly Installed Canopy at Door Casing.

**Question 228. Sometimes a combination wall outlet is found to have been installed too close to a door or window opening, so that the fixture canopy is prevented by the door or window casing from fitting back closely to the wall, thus leaving a three-quarter-inch opening more than half way round the canopy. Is there any Code rule under which this condition can be handled?**

Answer 1 (U). If an outlet box has been so installed, it is faulty construction, as all outlet boxes are to have metal or porcelain covers and in this case the door casing is of wood and forms part of a cover to the box. If there is no box installed I know no rule to prevent a block being used the thickness of the door or window casing, provided it is properly insulated where the wires come through.

Answer 2 (H). I doubt if any Code provision exactly covers this condition. In this territory we insist upon a wooden block properly hollowed out so that the canopy will absolutely protect the wiring inside it.

Answer 3 (V). Where wires are subject to injury, as at side-wall outlets, the canopy should fit tightly to the wall; this could be insisted upon under Rule 26 *e*.

Answer 4 (O). The matter of the proper fit and adjustment of fixture canopies is usually of more interest to the owner and architect than to the inspector. There may be some hazard involved here, but unfortunately there is no direct Code rule under which an inspector may insist upon a close fit between canopy and wall or ceiling. In fact, should the canopy be left off entirely, no Code rule would be violated, but the inspector might take the position, in case of conduit work, that the conduit system is not complete and insist that the outlet box be provided with a cover. In case of knob-and-tube work, however, the canopy may be left off entirely or may be adjusted in any position without violating any Code requirement.

Answer 5 (B). A special canopy should be furnished and installed with the fixture.

Answer 6 (P). I know of no rule that would apply, but would endeavor to base my objection on the "General Suggestions" found in the Code.

Answer 7 (F). There is no rule in the National Electrical Code requiring fixture canopies to fit closely against the finished surface of a building. However, in the case outlined it would be most easy to cut out the canopy so that a proper fit could be secured. This should be done for the sake of appearance if for nothing more.

Answer 8 (S). The Code rules for the installation of fixtures do not cover a case of this kind. I should require that a wood block be placed back of the canopy, or have the canopy cut to fit the door or window casing.

Answer 9 (E). There is no suggestion in the rules in the Code with which to treat this condition. Under the head of "General Suggestions," on page 5, in the third paragraph, however, the one who asks this question will find a suggestion which may prove helpful. All of the mechanical details of an installation could not be included in a book of rules, and I am convinced that an inspector would be justified in suggesting a solution of a problem, provided such solution was not contrary to the spirit and intent of the Code.

Answer 10 (N). There is no rule covering this case that I know of. It does occur once in a while in old houses from almost necessity, and then sometimes I call for a wood block behind the canopy, some times for a canopy cut to fit, depending on the special circumstances, and in one case at least the casing was cut out to fit. I once met it where a wall cupboard and mantel piece came very close and the outlet had to go between to balance one on the other side of the mantel and chimney breast. Here the canopy was cut on both sides and seated tightly.

### District of Columbia Jovian Meeting.

The regular monthly meeting of the District of Columbia section of the Jovian Order was held on April 21, in the new office building of the Potomac Electric Power Company. Statesman E. S. Marlow, manager of the Commercial Department of the Potomac Electric Power Company, presided. The meeting was a great success in every respect. It was well attended and the spirit of co-operation was very much in evidence.

Mr. Marlow in his opening remarks mentioned the value of co-operation and the great work the Jovian Order could do in this regard so far as the contractors and public-utility corporations, as well as the users of electricity, were concerned.

Arthur Dunlop, of the National Electrical Supply Company, spoke on the necessity of the members co-operating with the statesman in his administration of the office of the local section of the Order.

T. L. Townsend, vice-president of the National Electrical Supply Company, past statesman, talked on the value of regular attendance at the meetings by the members and the necessity of their taking active part in the proceedings.

Elections to fill the offices of secretary and treasurer of the section were held and C. B. Mirick was elected secretary and H. R. Carroll, treasurer.

A talk on the history of electric service in Washington and the various uses of electricity in connection with the home was given by G. P. Mangan, of the Potomac Electric Power Company. This talk was illustrated by motion pictures and lantern slides under the direction of H. A. Brooks, also of the Potomac company.

A buffet supper was served.

The next meeting of the section will be on the occasion of the next rejuvenation, Thursday, May 15.

# Thirty Years Ago.

## Electrical News of 1883 as Presented in the "Electrical Review," the Pioneer Electrical Weekly of the United States—Seventh Installment.

*(From "Electrical Review," New York, May 3, 1883.)*

Would it not be a move in the right direction for the New York Electrical Society to inaugurate a school of mathematics?

The city of Boston has appropriated $83,000 for electric lighting this year. This is the largest appropriation ever made in any city in this country for that purpose. The Brush Electric Light Company, of Boston, expects to get most of this lighting.

The West Shore Railroad contractors are using the electric light for night work in the vicinity of Newark, Wayne County, N. Y. As soon as the ground is soft enough to admit of plowing and scraping, the electric light will be used through Monroe County.

It is only a question of time, no doubt, and not a very long time at that, either, when navigation through the air will be an accomplished fact. By this means, also, the North Pole may be discovered, and such certainly would be the most natural and desirable means of reaching that result.

For the last two months the Western Union Telegraph Company has been working its line between New York and Chicago with the Wheatstone automatic system, which for nearly five years has been in constant use in England, where it is regarded as a valuable system for use in any office doing a large business.

The installation of 200 Edison lamps in the offices of the New York *Sun* is a notable victory for the Edison Company, as one of the principal owners of that journal is a heavy holder of gas stocks, and it has been the chief opponent of Edison's system. It has had an article this very month insisting that electric lighting was a failure.

The Armington & Sims Engine Works, Providence, R. I., have within the last week received orders for twelve engines for the village plant or system of lighting with the Edison incandescent light. Also for engines for smaller capacity of plant for a village isolated light. All the above engines are ordered to be run in connection with the Edison incandescent system of lighting.

Some of the principal capitalists of Danville, Pa., have organized a new company known as the Edison Electric Illuminating Company of Danville, with a capital stock of $50,000. Arrangements are being made to build a 200-horsepower engine and all the necessary equipments. The town has been paying extravagant prices for gas for several years, and this new enterprise is hailed with delight by the citizens.

At the meeting of representatives of telegraph and electrical companies last Friday, to consider the subject of underground electrical communication, it was resolved to appoint a general committee to take charge of and push the matter. The committee has been appointed as follows: Thomas J. Montgomery, H. L. Bailey, D. H. Bates, A. B. Chandler, W. A. Childs, Governor Grover Cleveland, H. Cummins, L. E. Curtis, J. P. Davis, S. B. Eaton, Mayor Franklin Edson, C. R. Flint, R. R. Hazard, E. Holmes, C. B. Hotchkiss, W. M. Ivins, F. H. May, G. S. Mott, H. W. Pope, C. W. Price, A. C. Richards, J. Eliot Smith, Elihu Thomson.

A machinist came into our office the other day carrying under his arm a home-made specimen of an underground conduit for electric wires, which he informed us he had invented and for which he had obtained a patent. We examined it carefully and finally told him that while we had no doubt, if properly constructed, it would make a good insulator, we feared that, as its principal insulating material had a high inductive capacity, trouble would arise therefrom. We casually informed him that there were already some 300 wire conduits on the market, but none of them had thus far successfully overcome induction, which, we added, is now the great desideratum in an underground wire conduit. "What," asked he, "is induction?"

The Gilliland Electric Works, of Indianapolis, one of seven factories that are supplying the world with the essential portions of the telephone, is to be removed to Chicago in September. One year ago the Western Electric Company was formed with a capital of $1,000,000. Into it the four formerly independent companies of New York, Chicago, Boston and Indianapolis were pooled. The company, though it has an interest in other telephone factories in this country and Europe, found the combined facilities unequal to keeping pace with the increasing demand. It is therefore erecting, at the corner of Clinton and Van Buren Streets, Chicago, a building that will be one of the largest in the country, being 150 by 300 feet, and six stories high.

Trouble has always been experienced in cotton and woolen mills by reason of the generation of electricity by the friction of the belts in the pulleys. This electricity being carried into the spinning machine, affects the cotton, especially if it is in a loose condition, before it is warped, and causes it to fly apart and stick to all portions of the machinery, thus causing great trouble. A means of remedying this was recently discovered by F. W. Whiting, a clerk in the Boston Manufacturers' Mutual Insurance Company. Going to the carding room, the young man attached a wire to one of the carding machines and carried the other end to the gas pipe, where he fastened it. The trouble ceased at once, and doubtless everybody present wondered why he had not thought of it before.

"PORTABLE ELECTRIC TESTING APPARATUS," BY C. J. H. WOODBURY, BEFORE THE FRANKLIN INSTITUTE, APRIL 18, 1883.—The use of electricity for lighting purposes has introduced a new element in the matter of testing such systems. Hitherto the sole object in testing telephone, telegraph and other signal lines was confined to purposes connected with the operation or repair of the apparatus.

Electric faults in the telegraph never injured person or property. Contact with telephone lines never robbed a fire department of its right arm by destroying the fire-alarm boxes. There is no instance of these weak currents ever setting fires or causing severe personal injuries like those which have been traced to electric lighting currents.

The difficulties connected with the introduction of the electric light have been inseparable with the use of a new form of energy, for the currents have been so much greater than those hitherto used that their application was virtually a new science. Twenty years after il-

luminating gas was known, the architect of the House of Commons specified that no woodwork should approach within six inches of a gas pipe.

Whenever an electric lighting current has been diverted from the system, it has generally given unwelcome evidence of its energy. Such occurrences, considered as an accidental loss of energy, are comparable to the bursting of a boiler or the yielding of a dam; but there is no chance of such extensive injuries to life and property from any mishaps resulting from the use of electric lighting apparatus.

Wherever the use of a large amount of power is involved, the safety is dependent upon the facility with which the whole is held under control, whether it be the head of water against the water wheel, the steam in the boiler, or the electricity in the circuit. The experience with the electric light is showing that these currents are more easily controlled than other forms of energy, as far as any elements of danger are concerned.

It is not necessary at this time to recount any of the fires caused by electric lighting, but I am not aware of a single fire of this nature which, in the light of present knowledge upon the subject, is not to be considered as a preventable fire. With proper and *continual* attention to insulation, construction of lamps and of switches, and in the incandescent system, also the proper size of conducting wires and *closed* safety catches, there can be so little opportunity for fire from electric lights that, under these conditions, it forms the safest method of illumination.

Most of the fires and other difficulties with electric lighting apparatus have been caused by the diversion of the current from the system at distant points, each leading to the earth, and very few accidents due to a conductor making a cross between two adjacent wires. Two contacts are required in order to form the complete circuit necessary to establish an electric current. If a single conductor leads to the earth, only a second one is necessary to divert a portion of the current from the system to the earth, the relative quantities of the current seeking the two paths being inversely proportional to their electrical resistances.

Such a diversion of the electricity causes first the commercial loss of electricity. If the contacts are of a nature to diminish the resistance of the circuit, then there is great liability of injury to the armature or commutator in most dynamo machines. The fires have been produced where the electricity met with a conductor of sufficiently high resistance to convert the electricity into heat whose temperature is high enough to burn any combustible substance.

The instances were usually on a circuit where one ground connection already existed, and a stream of water leaking during storms, or from washing floors, running over the wires and to the earth formed a good conductor, which was soon removed, as the electricity dissociated the water, and then an arc was formed as the current strove to maintain itself. Pure rain water is a very poor conductor of electricity; but, in trickling over plaster or whitewash, it takes enough lime or salt into solution to increase its conductivity many times. In some instances the water connected two wires of different potential. We see the same action when the current is let on an arc-lighting system. When the carbons touch, there is little resistance, and would be no light if the feeding apparatus was not arranged so as to draw the carbons apart, and thus present the resistance of the space of the distance between the two carbons.

In the early application of electric lighting apparatus, ground return circuits were used as in other electrical circuits, but there were so many difficulties that it was abandoned, and metallic circuits are now universally used. I believe Edwin J. Houston, of Philadelphia, was the first one to indicate the dangers of using electric lighting circuits with ground returns.

If an electric lighting plant is well constructed and installed in a proper manner, there is no certainty that it will remain in a satisfactory condition on account of the numerous changes, blunders and accidents to which it is subjected. It is important that each circuit should be provided with some apparatus for the purpose of making frequent tests of the insulation of the whole system. The most precise method is to use a galvanometer, with a rheostat and battery; but this involves delicate and expensive apparatus, which cannot be used by any one except an electrician, while the weight and bulk of the galvanometer, rheostat and ten cells of batteries renders it impracticable for portable use.

The engraving shows a portable instrument for the purpose of electric testing, made from my designs by Charles Williams, Jr., of Boston.

It consists of a Siemens armature in the field of a battery of five permanent magnets. There is no commutator, and the alternating current passes through the coils of a polarized electromagnet which vibrates a striker between two gong bells whenever the circuit is electrically complete.

The armature is revolved from a driving wheel by means of a quarter-turn belt which passes around an adjustable guide pulley, whose position can be changed so as to give any desired tension to the belt.

At the end of the case are two reels, each of which contains steel tapes 30 feet in length, forming flexible conductors which are provided with spring clamps at their ends.

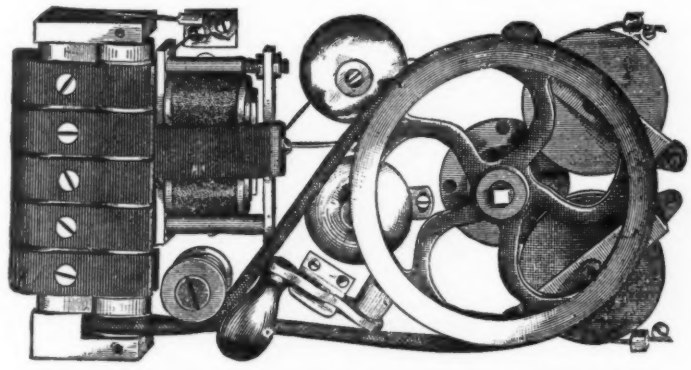
The driving wheel and the reels are turned by means of a crank which fits with square dowels, like a clock key, and when not in use is held by a spring clip, as shown in the engraving.

The armature is wound with 6,000 feet of No. 40 wire, and measures one inch in diameter by three inches in length. The whole is contained in a hard-rubber case 1.25 inches thick, 4 inches wide and 8 inches long, and weighs 3 pounds.

The bell will ring through an external resistance of 7,000 ohms, when the crank is being turned about 200 times per minute.

The whole efficiency of the testing apparatus depends upon its ability to detect any ground which could under any circumstances become an element of danger. The resistance of the arc-lighting circuits (cold) is very variable, owing to the irregular resistance between the tips of the carbons.

The apparatus requires no electrical skill for its use, is not affected by time or temperature, and can be used in any position. It has stood the test of over a year's constant use, without accident or deterioration of any nature.



"Thirty Years Ago"—Woodbury's Portable Electric Testing Apparatus.

George L. Wiley, the present general manager of the Mexican Telephone Company, was elected on the seventh of March last. He was several years superintendent of the Metropolitan Company of New York, and also vice-president and general manager of the Central Telephone Company. Since he came here he has by his excellent business capacity rapidly promoted the Mexican Telephone Company's interest, and it may be reasonably expected that the number of telephones and miles of wire will be doubled during the current year. The Mexican Telephone Company has the exclusive right to use the Bell Telephone Company's patents in Mexico.

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A meeting was held at Davenport, Iowa, on the twenty-first instant, of stockholders of the Midland, the Central and the Western Telephone Companies. The outcome of the meeting is said to have been that the representatives present favor a grand consolidation of these three companies, controlling Ohio, Indiana, Illinois and Iowa. One-third of the consolidated stock will be sold to the Bell Telephone Company, as a guarantee that it will not pass into other hands.

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Negotiations with a view of consolidating the electric motor patents of Edison and Stephen D. Field have been going on for the last month, and resulted yesterday in the signing of contracts by both parties, which put an end to the fight and give the patents into the control of a new company. A local or subordinate company will be formed for the purpose of introducing the electric motors on the elevated roads, while the general company will have jurisdiction over the whole United States. Mr. Edison said that the reason of his apparent readiness to sell his patents to a new company was that he had no time to take charge of the motor branch of the electric business. The electric light alone was sufficient for his company, and the business was growing so fast that it would soon be all that could be attended to. Experiments by the new company will be continued at Menlo Park under the management of Mr. Field.

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We have been told by no less an authority than Professor Edison that "the only purpose served by the storage battery is that of developing man's latent propensity for lying." Yet on every hand we see successful mechanical contrivances which could never have been without the interposition of the storage battery. A question of great interest in connection with the secondary battery has reference to its permanence, and possibly it was regarding this point that Edison spoke when he expressed himself so strong a disbeliever in the storage battery. A fear has often been expressed that local action would soon destroy the fabric of which this battery is composed, and that the active surfaces would soon become coated with sulphate of lead, preventing further action. This, however, has been disproved by Dr. Frankland before the Royal Society, corroborated by simultaneous investigations by Dr. Gladstone and Mr. Tribe. They showed that the action of the secondary battery depended essentially upon the alternative composition and decomposition of sulphate of lead, which is therefore not an enemy but an aid to its action.

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LONG-DISTANCE TELEPHONING.—Since the successful experiments between Baltimore and Chicago, and New York and Chicago, long-distance telephoning is the question of the hour. The last few years have been marked with great discoveries in the regions of electricity, and yet it will not strike the average reader as extravagance to say that there lies yet beyond as vast a field for exploration, and a more mysterious, if not more awful one, than Columbus entered when he dared sail out into the unknown ocean. It is this uncertainty that allows the imaginations of speculators in electric inventions to run riot, and which is affording a rich harvest to sharpers, whose "little knowledge" of electricity is "a dangerous thing"—to their victims. In a science which may never become an exact one, and where the nature of the agency can only be feebly guessed at from its "manifestations," and its habits learned only by experience, it is the "practical scientist" that must be appealed to for really useful information. E. T. Gilliland, who a few years ago was known in Cincinnati as "our Western Edison," and who has proved himself almost *the* practical electric expert of the country, is eminently such. To the technical knowledge that enables him to superintend the intricate details of the manufacture of all kinds of electric apparatus, and to meet competition as perfector and inventor, he unites a broad knowledge of their application that makes him one of the few men, in any position in this world, whom it would be difficult to replace. His views on long-distance telephony are therefore given with confidence in their value and general interest:

"It has been demonstrated that it is entirely practical, with the new compound wire, to hold a telephonic conversation between Chicago and New York City. Without knowing what royalty would be asked by the owners of the patent, I believe that the cost of the wire itself will prevent telephoning at as great a distance as you have named ever becoming popular in the business sense of that word, and as an investment I doubt if it can ever be made to pay. To talk over the 1,200 miles between Chicago and New York there must be used either the compound wire or an iron one several times as heavy—an impracticable size. The copper wire would require about 36 poles to the mile, and I have roughly estimated its cost at $400,000. Only one wire can be used upon one set of poles, for even at the extreme ends of long cross-arms, at such a distance what was said to one wire would be heard on the other, and vice versa, owing to induction. In fact, we find it impractical from this reason to put more than one wire on one set of poles for distances greater than three miles, four miles being the very limit, even if far apart."

"Won't this induction trouble be overcome?"

"If it is, the inventor can make millions of dollars. No remedy is yet known that is not more costly than the disease. If it were overcome, telephoning would be brought nearer to a par with telegraphy on the score of cost of wires, though the latter would still have the advantage of being able through the quadruplex of making one wire do the work of four, or, through the harmonic system, of eight—things impossible in telephoning."

"Then telephoning for, say, 1,000 miles, is possible, but not probable?"

"Exactly, for distances of 100 miles or a little over, groups of cities, however, will be united by telephone, and within a short period, under what is known as the 'extra territorial' license system, Louisville, Indianapolis and Cincinnati will be in daily communication with each other by telephone. For this purpose a No. 8 or No. 9 wire will be sufficient, the one having a little over 14 ohms resistance and weighing 380 pounds to the mile, and the other nearly 16.5 ohms resistance and weighing 320 pounds to the mile. For almost any distance by land the obstacles are only mercantile, but as to the sea, the telegraph stopped at its ebb-tide for years, and the telephone halts on its shore for the present."

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### Some Electrical Patents of 30 Years Ago.

*April 3, 1883:*

Automatic signaling apparatus for telephone circuits, Theodore N. Vail, Boston, Mass.

Duplex telegraph, Joseph E. Fenn, Elizabeth, N. J.

Electric conductor for railway track circuits, electric elevator, receiving instruments for quadruplex telegraphy, speaking telephone, Stephen D. Field, New York.

Electric arc lamp, F. G. Waterhouse, Sacramento, Cal.

Electric arc lamp, six patents, Edgar A. Edwards, Cincinnati, O.

Safety self-closing shunt switch for electric-light circuits, Elihu Thomson, New Britain, Conn.

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(***Quotations from*** ELECTRICAL REVIEW ***of May 10, 1883, will appear next week.***)

# Iowa Electrical Association.

## Annual Convention, Waterloo, Iowa, April 23 and 24.

What was officially the first annual convention of the Iowa Electrical Association as a section of the National Electric Light Association, was held in Waterloo, Iowa, April 23 and 24, although, in reality, this was the thirteenth of this organization's conventions. The meetings, as well as the exhibits of apparatus and materials maintained by the manufacturers, were held in the magnificent new office building of the Citizens Gas & Electric Company, where ample accommodations were afforded.

The most engaging question in central-station activities at the present time, particularly in Iowa, is high-tension transmission, and this was the keynote of the present convention. All, save two, of the papers, dealt with some phase of this important subject and many data of value were brought out, especially as regards cost and maintenance.

Too much credit cannot be given W. H. Thomson, president of the Association, for his untiring efforts in arranging for the convention, as well as the manner in which the meetings were conducted. Mr. Thomson's duties were especially strenuous, inasmuch as he and Secretary Maynard assumed their respective offices late in the year and but little time was available in which to arrange for the convention and look after the many details attending affiliation with the National Association.

The first session was opened with an address of welcome extended in behalf of the city by H. E. Kiester. H. C. Blackwell, of Davenport, made a very graceful response in which he called particular attention to the Citizens Gas & Electric Building, which he said would do credit to a much larger city than Waterloo. He also held it as a sign of the times that a central-station company should do its part in beautifying the city by erecting modern and attractive buildings for its own use.

The president's address, which followed, outlined briefly some of the activities during the past year. Mr. Thomson referred to the work of the Executive Committee in connection with the steps leading to affiliation and pointed out some of the benefits accruing from membership in the N. E. L. A. Special mention was made of the Bulletin, Question Box and various books published by the Association, such as Meterman's Handbook, Salesman's Handbook, etc.

President Thomson devoted special attention in his remarks to legislative affairs. The Association has sent out briefs of all bills introduced during the year that affect central-stations. The bill providing for commission regulation was defeated by one vote. Mr. Thomson held that a majority of those voting against the bill probably objected to the measure because they desired to use local regulation as a political club in their communities. One of the important bills passed was that granting to municipalities the right to build lines outside of their communities in order to tap a transmission line and also to serve farmers.

In concluding Mr. Thomson referred to the papers on transmission and called attention to the importance of this subject to Iowa companies.

The reading of the new constitution and by-laws of the Association was then taken up. Changes had to be made in several sections of the old constitution, in regard to membership and dues, in order to comply with the constitution of the National Association. The Nominating Committee was then elected as follows: O. E. Brownell, Lake City; Rufus E. Lee, Clarinda; H. C. Blackwell, Davenport; J. C. Young, Cedar Rapids; and A. D. Ayres, Keokuk.

At the opening of the afternoon session, F. A. Fish, of Ames, chairman of the Committee on Grounded Secondaries, reported that a continuation of the tests described last year did not warrant any further discussion, the results being about the same.

President Thomson spoke briefly relative to the importance of grounding properly. Two incidents causing fatal accidents to customers of the Des Moines company were recounted. Mr. Thomson held that no outlets or fixtures should be placed so that a person could touch a water pipe, faucet, bath tub, etc., while using any of the electrical fittings.

At this point the question of selecting the next meeting place was taken up. After a cordial invitation from the Commercial Club and electrical interests of Cedar Rapids that city was decided upon.

The paper by C. W. Drade, of the Westinghouse Electric & Manufacturing Company, on "Off-Peak Possibilities" was then presented. Some statistics showing what central stations of Iowa could expect in the way of commercial development were given. Government reports show that the average population per square mile in Iowa is 40, while in Rhode Island it is 510. Naturally, therefore, the primary horsepower per square mile in Iowa is only 2.8, while in Rhode Island it is 212. This is accounted for by the fact that Iowa is purely an agricultural state, the amount of manufacturing being very small. Mr. Drake said that there is a considerable field for development, however, as the same reports indicate that only 12 per cent of the total population is at present served by central stations.

In regard to power business, with which the paper dealt, it was suggested that the load-factor of the station be improved first. This can be done by securing a large amount of small diversified business, which is available in practically every town. A systematic campaign must be instituted for the larger business. It is preferable to divide the prospects according to industries rather than according to territory. A salesman can thus acquaint himself with the details of an industry and will therefore be in a better position to talk intelligently with a prospect regarding power applications.

The brick and tile industry is the predominating one in Iowa. From the central-station standpoint this business has desirable characteristics as the heaviest demand for power comes in summer when the demand on the central station is least. Also the hours of operation are limited to the daylight hours, this making the load an off-peak one. When steam drying is employed, brick plants can very seldom if ever be secured, so that central stations should advocate and boost the waste-heat method. When the latter is employed, central-station power proves very economical. The kilowatt-hour consumption per 1,000 bricks varies from 22 when hard clay is used, to 5 or 10 when soft clay is used.

Water pumping is another profitable field for central-station power and is also an off-peak load, particularly where the reservoir system is employed. As in brick plants, the maximum demand comes in summer.

Mr. Drake pointed out the desirability of the refrigerating and ice-making load. The latter is gaining considerably in volume as raw-water ice becomes more common. Ventilation in buildings and mines was also mentioned as a good field for central-station off-peak power. A number of lantern slides showing typical and some unusual motor applications were shown during the presentation of the paper.

In opening the discussion, J. C. Young, of Cedar Rapids, asked if it was feasible to change steam-operated trip hammers to air-driven and what the relative efficiency of the latter was. Mr. Drake stated that so many variables enter into the operation of trip hammers that no specific figures could be given but that saving was effected in every case that had come to his attention.

President Thomson called attention to the effect of load-factor on central-station rates. In connection with off-peak business a special rate should be made. The Des Moines company is supplying power to a flour mill, two coal mines and two clay and tile works on an off-peak basis. The mine fans operate 24 hours per day, however, and thus cover the peak.

A paper entitled "Welfare Work and Allied Relations Toward Employees" was then presented by E. M. Walker, of Dubuque. This paper points out that welfare work for employees also benefits the employer. Welfare work is really an index of the growth of the feeling of the brotherhood of man and the dependence of each man upon his fellows. The payment of wages to a worker hires only his muscles; the best achievements are secured only when the heart, the brain and the muscle work together. Therefore, the maximum of efficiency can come only where there is a humane bond existing between the master on the one hand and the worker on the other.

Mr. Walker states that the worker cannot progress economically unless, besides a fair wage and pleasant surroundings, he has cheerfulness and hopefulness, and it is the aim of all so-called welfare work to produce these

FACTS AND FACTORS.

| STATION No. | Population Served | Consumers Per 100 Population | Station Capacity | Station Capacity Per Capita in Watts. | Station Capacity Per Employee | Ratio of Station Capacity To Conn. Load | Average Load | Ratio of Average Load To Station Capacity | Annual Load-Factor | Investment Per Kilowatt Capacity | Investment Per Capita | Gross Income Per Kilowatt Capacity | Gross Income Per Consumer | Gross Income Per Capita | Gross Income Per $100 Invested | Gross Income Per Kilowatt Hours Made | Ratio of Expense To Gross Income | Net Earnings Per $100 Invested | Total Time In Operation | 8,760-Hour Load-Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | K.W. | | K.W. | % | K. W. | % | % | | | | | | | Cts. | % | | Hrs. | % |
| 1 | 750 | 14.9 | 75 | 100 | 36 | 25 | 68 | 90.6 | 34.7 | $100 | $10.00 | $ 33.33 | $ 22.33 | $ 3.33 | $ 33.33 | 1.1 | 60 | $22.00 | 3,200 | 9.9 |
| 2 | 900 | 9.4 | 17 | 19 | 17 | 70.8 | ..... | ..... | ..... | 400 | 7.55 | 139.40 | 27.88 | 2.63 | 34.85 | ..... | 64.5 | 10.38 | ..... | ..... |
| 3 | 1,100 | 14.5 | 50 | 45 | 25 | 62.5 | 8 | 16 | 32 | 260 | 11.82 | 100.00 | 31.25 | 4.54 | 38.46 | 9.5 | 65 | 11.46 | 6,570 | 23.9 |
| 4 | 1,200 | 12.3 | 50 | 42 | 25 | 31.3 | 17.2 | 34.4 | 12 | 409 | 17.04 | 105.00 | 35.34 | 4.37 | 25.57 | 12.8 | 79.8 | 3.17 | 2,370 | 3.2 |
| 5 | 1,200 | 10.2 | 50 | 42 | 25 | 37 | 13.6 | 27.2 | 38.9 | 360 | 15.00 | 71.20 | 26.37 | 2.97 | 19.78 | 5.3 | 58.8 | 6.15 | 4,200 | 18.6 |
| 6 | 1,300 | 12.4 | 60 | 46 | 30 | 59 | 13.2 | 21.9 | 42.5 | 150 | 6.92 | 96.50 | 35.60 | 4.44 | 64.11 | 11.8 | 52 | 28.78 | 3,725 | 18 |
| 7 | 1,500 | 23.3 | 125 | 83 | 25 | ..... | ..... | ..... | ..... | 160 | 13.33 | 96.00 | 31.42 | 8.00 | 60.00 | .... | 83.3 | 8.00 | ..... | ..... |
| 8 | 1,500 | 13.3 | 60 | 40 | 20 | 60 | 22.8 | 38.0 | 50.8 | 167 | 6.67 | 102.20 | 35.00 | 4.66 | 70.00 | 11 | 84 | 9.18 | 2,700 | 15.6 |
| 9 | 1,500 | 12.5 | 60 | 40 | 20 | 75 | 4.4 | 7.3 | 13.1 | 167 | 6.66 | 116.67 | 32.62 | 4.09 | 61.32 | 29.2 | 74.8 | 13.45 | 4,560 | 6.8 |
| 10 | 1,500 | 11.3 | 170 | 113 | 56 | 65.4 | 20 | 11.6 | 22.9 | 260 | 16.66 | 133.60 | 133.60 | 15.14 | 91.00 | 22.7 | 47.8 | 45.30 | 5,000 | 13.1 |
| 11 | 1,600 | 19.7 | 115 | 72 | 28.7 | 33.3 | 25 | 21.7 | 37.6 | 130 | 9.34 | 104.00 | 37.85 | 7.47 | 80.27 | 9.5 | 25 | 72.09 | 5,020 | 21.7 |
| 12 | 1,800 | 12.2 | 115 | 64 | 23 | 83.3 | 17 | 14.8 | 29.3 | 200 | 12.77 | 72.70 | 38.00 | 4.64 | 36.35 | 5.9 | 55 | 14.35 | 8,240 | 23.4 |
| 13 | 2,000 | 16.5 | 150 | 75 | 30 | ..... | ..... | ..... | ..... | 100 | 7.50 | 64.72 | 29.42 | 4.85 | 64.72 | .... | 82.8 | 9.14 | ..... | ..... |
| 14 | 2,000 | 16.1 | 140 | 70 | 35 | 70 | 13.3 | 9.3 | 19 | 170 | 11.90 | 70.60 | 30.75 | 4.95 | 41.65 | 9.3 | 99.5 | 2.28 | 8,000 | 17.3 |
| Average 1913 | 1,416 | 14.2 | 88 | 61 | 28 | 56 | 20.2 | 26.6 | 30.2 | 216 | 10.93 | 93.28 | 31.96 | 5.43 | 51.51 | 11.6 | 66.6 | 1.651 | 4,871 | 15.6 |
| Average 1911 | 1,415 | 11.9 | 82 | 62 | 36 | 94 | 19.4 | 26.3 | 33.8 | 205 | 11.03 | 84.30 | 48.20 | 4.33 | 43.50 | 10.9 | 73.4 | 4.23 | 4,840 | ..... |
| Average 1909 | 1,600 | 10 | 67 | 42 | 27 | 94 | ..... | ..... | 36 | 236 | 10.00 | 94.00 | 37.00 | 4.06 | 38.00 | .... | 70 | ..... | ..... | ..... |
| 15 | 2,300 | 18.3 | 175 | 76 | 44 | 50 | 30 | 17.1 | 44.6 | 228 | 17.36 | 148.00 | 61.60 | 11.26 | 65.00 | 9.9 | 83.3 | 8.76 | 8,700 | 44.8 |
| 16 | 2,350 | 10.5 | 130 | 55 | 26 | 52.6 | ..... | ..... | ..... | 230 | 12.75 | 85.30 | 44.80 | 4.72 | 37.00 | .... | 81.6 | 4.72 | 8,136 | ..... |
| 17 | 2,400 | 15.2 | 166 | 69 | 50 | 41 | 16.8 | 11.2 | 12.9 | 80 | 5.00 | 88.90 | 36.40 | 5.55 | 111.00 | 9 | 53 | 50.25 | 8,760 | 12.9 |
| 18 | 2,475 | 20.5 | 160 | 65 | 32 | 31.8 | 42.9 | 26.8 | 35.8 | 228 | 14.75 | 92.40 | 29.30 | 5.98 | 40.50 | 3.9 | 73.8 | 8.62 | 8,760 | 35.8 |
| 19 | 2,500 | 20 | 100 | 40 | 20 | 20 | 17 | 17 | 22.1 | 300 | 12.00 | 140.00 | 28.00 | 5.60 | 46.60 | 9.5 | 85.7 | 4.77 | 8,320 | 20.2 |
| 20 | 2,600 | 15.2 | 250 | 96 | 42 | 63.1 | 29 | 11.6 | 21.6 | 140 | 15.40 | 77.80 | 49.10 | 7.40 | 48.50 | 7.9 | 75.9 | 9.63 | 8,760 | 21.6 |
| Average 1913 | 2,437 | 16.6 | 163 | 67 | 36 | 43.1 | 27.1 | 16.7 | 27.4 | 201 | 12.88 | 105.40 | 41.53 | 6.76 | 58.10 | 8 | 75.6 | 14.46 | 8,573 | 27.1 |
| Average 1911 | 2,650 | 12.7 | 157 | 60 | 29 | 55 | 28.4 | 25.1 | 33. | 190 | 10.61 | 83.20 | 37.40 | 4.52 | 41.90 | 5.7 | 76.1 | 6.39 | 7,620 | ..... |
| Average 1909 | 2,470 | 10 | 122 | 44 | 38 | 48 | ..... | ..... | ..... | 221 | 9.40 | 95.00 | 43.00 | 4.04 | 41.00 | .... | 63. | ..... | ..... | ..... |
| 21 | 3,400 | 18 | 250 | 74 | 28.5 | ..... | ..... | ..... | ..... | 127 | 9.34 | 80.90 | 33.00 | 5.94 | 63.70 | .. | 73.5 | 14.90 | 3,59 | ..... |
| 22 | 3,500 | 10.1 | 200 | 57 | 25 | 90 | ..... | ..... | ..... | 133 | 7.60 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 8,260 | ..... |
| 23 | 3,500 | 14.1 | 125 | 36 | 25 | 92.5 | 28 | 22.4 | 26.8 | 320 | 11.44 | 120.00 | 30.25 | 4.28 | 37.50 | 6.2 | 72 | 8.47 | 8,260 | 26.3 |
| 24 | 3,500 | 14.3 | 300 | 86 | 60 | 50 | 62.5 | 20.8 | 34.8 | 100 | 8.57 | 150.00 | 90.00 | 12.85 | 150.00 | 8.7 | 39.4 | 89.18 | 8,200 | 32.5 |
| 25 | 5,000 | 10.5 | 210 | 42 | 26 | 46.6 | 37.4 | 17.8 | 38.7 | 288 | 12.10 | 92.90 | 37.10 | 3.90 | 32.50 | 9.3 | 44.2 | 16.00 | 8,472 | 36.6 |
| 26 | 5,000 | 12.3 | 450 | 90 | 45 | 58.8 | 102 | 22.7 | 30.9 | 220 | 19.80 | 112.50 | 73.10 | 9.90 | 50.00 | 5.6 | 70.9 | 12.04 | 8,760 | 30.9 |
| 27 | 5,000 | 12.2 | 190 | 38 | 19 | ..... | 55 | 28.9 | .... | 210 | 8.00 | 147.50 | 45.80 | 5.60 | 70.00 | 5.8 | 66 | 21.75 | 8,760 | .... |
| 28 | 7,500 | 11.7 | 490 | 65 | 38 | 55.5 | 115 | 23.5 | 33.8 | 380 | 24.50 | 109.30 | 60.20 | 7.10 | 28.60 | 10.6 | 77.7 | 4.35 | 4,380 | 17 |
| Average 1913 | 4,550 | 12.9 | 277 | 61 | 33.3 | 65.6 | 36.7 | 21.4 | 33 | 222 | 12.67 | 116.16 | 52.78 | 7.06 | 61.76 | 7.7 | 63.4 | 23.81 | 7,379 | 28.7 |
| Average 1911 | 4,580 | 11.5 | 239 | 53 | 33 | 74 | 42.1 | 18 | 26.7 | 248 | 12.30 | 88.50 | 38.75 | 4.46 | 38.25 | 6.8 | 67.1 | 9.95 | 7,720 | ..... |
| Average 1909 | 5,670 | 10 | 285 | 51 | 37 | 50 | ..... | ..... | ..... | 202 | 10.00 | 85.00 | 42.00 | 4.40 | 49.00 | .... | 56 | ..... | ..... | ..... |
| 29 | 16,200 | 4.5 | 750 | 46 | 107 | 62.5 | 148 | 19.7 | 15.8 | 800 | 37.05 | 72.80 | 76.05 | 3.43 | 92.60 | 4.3 | 54 | 2.26 | 8,760 | 15.8 |
| 30 | 17,000 | 9.8 | 850 | 50 | 85 | 43.5 | 176 | 20.7 | 27.9 | 358 | 17.90 | 102.30 | 52.10 | 5.11 | 28.50 | 5.6 | 46.6 | 26.00 | 8,760 | 27.9 |
| 31 | 18,000 | 7.2 | 1,650 | 92 | 165 | 62.5 | 322 | 19.5 | 45.4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 8,760 | 45.4 |
| Average 1913 | 17,060 | 7.2 | 1,080 | 63 | 119 | 56.2 | 215 | 20 | 29.7 | 579 | 27.47 | 82.55 | 64.07 | 4.27 | 60.55 | 4.9 | 50.3 | 14.13 | 8,760 | 29.7 |
| Average 1911 | 14,500 | 8.4 | 1,206 | 92 | 128 | 70 | 141 | 14.1 | 22.6 | 277 | 18.70 | 65.70 | 52.95 | 4.27 | 24.10 | 5.5 | 54.7 | 8.71 | 8,760 | ..... |
| Average 1909 | 15,500 | 5. | 775 | 50 | 71 | 67 | ..... | ..... | 22 | 139 | 8.00 | 60.00 | 60.00 | 3.20 | 54.00 | .... | 71 | ..... | ..... | ..... |
| 32 | 25,000 | 9.5 | 1,000 | 40 | 77.5 | 24.5 | 408 | 40.8 | 30.4 | 325 | 13.00 | 55.50 | 23.80 | 2.24 | 17.10 | 1.5 | 75.4 | 2.18 | 8,760 | 30.4 |
| 33 | 26,000 | 5.8 | 1,000 | 38 | 70 | 33.3 | 229 | 22.9 | 20 | 365 | 14.50 | 121.70 | 81.10 | 4.68 | 33.30 | 6.1 | 52.7 | 13.87 | 8,760 | 20 |
| 34 | 38,000 | 10.8 | 2,200 | 59 | 78.5 | 28.4 | 661 | 30 | 31.6 | 500 | 29.00 | 104.70 | 56.20 | 6.06 | 20.95 | 4. | 47.8 | 8.91 | 8,760 | 31.6 |
| 35 | 39,000 | 6.2 | 5,000 | 128 | 125 | 90.8 | 452 | 9 | 18.1 | 180 | 23.10 | 38.30 | 79.80 | 4.91 | 21.28 | 4.8 | 46.1 | 9.28 | 8,760 | 18.1 |
| 36 | 43,500 | 11.2 | 3,000 | 69 | 75 | ..... | 808 | 27 | .... | 517 | 35.70 | 97.30 | 59.60 | 6.70 | 18.82 | 4.1 | 50.6 | 7.30 | 8,760 | .... |
| 37 | 50,000 | 1.4 | 900 | 18 | 450 | 33.4 | 228 | 25.3 | 22 | 155 | 2.79 | 92.78 | 116.00 | 1.67 | 59.80 | 4.2 | 36 | 23.50 | 8,760 | 22 |
| 38 | 90,000 | 7.7 | 8,750 | 95 | 588 | 127 | 1,367 | 16.1 | 34 | 223 | 21.30 | 59.20 | 81.20 | 5.60 | 26.30 | 4.2 | 46 | 12.20 | 8,760 | 34 |
| Average 1913 | 44,500 | 7.5 | 3,120 | 64 | 209 | 56.2 | 593 | 24.4 | 24.3 | 326 | 19.91 | 81.35 | 71.10 | 4.52 | 28.22 | 4.1 | 50.6 | 11.03 | 8,760 | 26 |
| Average 1911 | 55,600 | 6.2 | 2,890 | 51 | 81 | 43 | 653 | 22.7 | 31.5 | 541 | 27.20 | 80.50 | 68.90 | 4.17 | 15.27 | 4.1 | 48.9 | 6.26 | 8,750 | ..... |
| Average 1909 | 53,000 | 5 | 2,110 | 46 | 262 | 42 | ..... | ..... | 24 | 195 | 9.00 | 88.00 | 79.00 | 3.50 | 42.00 | .... | 51 | ..... | ..... | ..... |
| Grand Average 1913 | 11,400 | 12.5 | 778 | 61 | 71 | 35.5 | 155 | 23.2 | 29.3 | 255 | 14.23 | 93.50 | 49.90 | 5.74 | 50.60 | 8.2 | 63.6 | 17.00 | 6,950 | 23.2 |
| Grand Average 1911 | 14,920 | 10.6 | 576 | 64 | 51 | 72 | 117 | 22. | 30.1 | 252 | 13.85 | 82.10 | 47.60 | 4.36 | 36.80 | 7.8 | 67.5 | 7.82 | 6,710 | ..... |
| Grand Average 1909 | 9,411 | 9 | 401 | 44 | 63 | 56 | ..... | ..... | 32 | 220 | 9.60 | 89.50 | 46.00 | 3.93 | 41.60 | .... | 64 | ..... | ..... | ..... |

conditions. The growth of our industrial institutions, Mr. Walker points out, has separated the worker and master to such an extent that they are unknown to each other and have no interest except the fulfillment of the contract implied in the worker's employment. These developments have pointed out the need of humanity work.

The author mentions briefly some of the different forms of welfare work which have been practiced especially in public-utility companies. These include club rooms provided by the company for social gatherings; mutual insurance clubs; pension funds; investment clubs; evening schools; and even plans for co-operative buying. There are many ways of carrying out any or all of these plans which must suggest themselves differently in different localities. They all have a humanitarian object and all are bound, if carried out in the proper spirit, to produce good results.

H. W. Garner, of Oskaloosa, opened the discussion. He commented on the Employers' Liability Law which has recently been passed by the Iowa legislature and thought that it should be made, in some way, to cover sickness. More distress is caused by this than by accidents.

J. C. Young, of Cedar Rapids, also commented briefly on the bill. He brought out the point that it is optional with the employee whether or not he works under the law.

W. H. Thomson, of Des Moines, called attention to a form of welfare work which he has inaugurated. A question box has been provided in each department by means of which employees can confidentially ask any questions regarding any phase of their work. All grievances can, in this way, also be taken up directly with the general manager and the department heads have no means of knowing of any employee who takes advantage of this method. Although in operation for six weeks, only three questions have so far been submitted.

H. C. Blackwell, of Davenport, described a plan instituted in his city for bringing department heads together. At first a meeting was held every Wednesday but such progress has been made that they are now held every two weeks. At these meetings the work of each department is discussd, as well as the various systems and routine methods of the company. Recently, meetings of all employees have been held at which similar subjects are taken up. Mr. Blackwell reported that good results are evidenced from these meetings.

Austin Burt, of Waterloo, referred to the very small plants where but few men are employed. In these cases meetings are hardly necessary, but the information presented in the National *Bulletin* and Question Box, in a measure, take the place of the meetings held in the larger towns.

Following this discussion, an executive session was held at which various business matters were taken up.

The report of the Committee on Facts and Factors, of which Austin Burt is chairman, was presented at the session on Thursday morning. I. L. Craig, of Waterloo, presented the report which is essentially a compilation of data received from a number of Iowa companies. The accompanying table gives the figures presented by the companies replying.

F. A. Fish, of Ames, offered the services of the State College in preparing the next report. He volunteered to send a man to each plant and personally collect the required data. The offer was unanimously accepted.

The paper by V. A. Hain, of the General Electric Company, entitled, "Modern Practice on Feeder and Voltage Regulation" was next presented. In opening, Mr. Hain pointed out the importance of regulation, as the efficiency of a system depends upon the efficiency of the regulation. Regulation is equally important to company and customer, as, for instance, a variation of four per cent in voltage means a 20-per-cent reduction in candlepower of a carbon lamp and a proportionate reduction in wattage. Life of lamps is considerably shortened by poor regulation, although tungsten-filament lamps are less affected than carbons. The cost of renewals to the company, when free, is considerably increased when lamps are burned on poorly regulated circuits.

Good regulation is also essential for power circuits, as the horsepower output of motors is greatly reduced by varying voltage. Tables and curves showing graphically the results of poor regulation on revenues were presented.

In the early days voltage was regulated by hand regulators at the switchboard. Developments have made automatic regulating devices now necessary, and the various types of these on the market were described. The Tirrill regulator was recommended for regulating generator voltage in the station and switch and pole-type regulators for feeders. Wiring diagrams and illustrations of each type were shown.

The paper was concluded at the afternoon session and was followed by a paper by John M. Drabelle, of Cedar Rapids, entitled "Factors Determining Rural-Line Extensions." That farmers demand electric service is indicated by the large number of gasoline-electric sets being installed. These sets are, however, limited in their output, expensive to operate and they require considerable attention. On the other hand, central-station power is practically unlimited in flexibility, economical to operate and requires practically no attention. However, there are many difficulties in the way of supplying power to farmers, the principal one being the initial cost of building the line.

In considering farm business many features have to be considered; such as voltage of transmission line, transformer capacity necessary, type of line, right-of-way, etc. The initial investment depends upon these questions. Mr. Drabelle advocated a voltage of 6,600, as a higher voltage means increased cost of transformers and lightning arresters, while a voltage too low increases the size of wire needed. No. 6 wire is the smallest that should be used. Iron wire is strong and cheap but, so far, is not extensively used.

Mr. Drabelle gave some details of a 2,300-6,600-volt farm line constructed by the Cedar Rapids company which cost between $325 and $417 per mile, not including transformers or conductors. In constructing transmission lines care should be taken to prevent interference with telephone lines, although this is difficult where grounded telephone circuits are used. The Cedar Rapids company has found that if it could figure on the basis of one customer per half mile farm business would be profitable.

Mention was made of the field for motors on the farm and figures on the horsepower required given. Household appliances and lighting were also referred to. In conclusion, Mr. Drabelle read the contract of the Cedar Rapids company for farm customers.

The paper by H. W. Garner, of Oskaloosa, on "Details and Design of High Tension Transmission Lines," was next presented. This is a very valuable paper commenting on present types of construction work in Iowa; some details of transmission-line construction; and gives a complete analysis of the cost of a 11,000-volt steel line constructed by the Oskaloosa company. This paper will appear in a later issue.

The paper by Rufus E. Lee, of Clarinda, entitled "Details of Operation and Maintenance of High-Tension Transmission Lines" was presented next and the discussion of all three papers taken up. Mr. Lee's paper makes many pertinent suggestions for the operation and maintenance of lines. Aluminum-cell lightning arresters are advocated but other types were considered useless. Short-circuiting of lines can be avoided by avoiding all unnecessary strain on wires. Puncturing insulators and be avoided by using insulators rated much

above the voltage of the line on which they are to be used. Care should be exercised in selecting transformers and Mr. Lee held that the best can not be too good. The placing and selection of fuses should be given especial attention and line switches should be used between transformers and lines, and at all junction points. Falling of trees on transmission lines is a trouble that should be prevented by either getting permission to remove dangerous trees, or build line over trees. Where special protection is required such as over crossings, Mr. Lee favored using wire of larger cross-section rather than using guard wires. In short, careful construction methods and practical and reliable apparatus should be used in all cases.

It has been found very convenient in Clarinda to prepare blue prints of all transmission lines, giving all details including the names of the farmers along the line. This enables troubles to be easily located when information is telephoned by farmers along the line. A log book of all line interruptions is kept and this has enabled the company to compare weaknesses in line and material. Mr. Lee described the 13,200-volt line of the Clarinda company with which little trouble has been encountered. The original line was seven miles long and was constructed with 30 to 35-foot poles spaced 150 feet apart, on which were placed 36-inch creosoted cross-arms equipped with locust pins and 23,000-volt insulators. The top wire was placed on a separable iron pole-top pin bolted to the side of the pole. An additional 15 miles of line was subsequently built using steel poles imbedded in concrete and finally an additional 17 miles of the same construction. The line has been in operation 18 months and eight interruptions of a minor character have been encountered. The total cost of the line per mile averaged $800.

H. W. Garner, of Oskaloosa, opened the discussion calling attention to the induction troubles caused in telephone lines when a high-tension line is built in the vicinity. He asked if electric companies could be held legally responsible for damages to grounded telephone lines accruing from the operating of power lines.

J. M. Drabelle, of Cedar Rapids, explained that the Iowa law requires both companies to have safe and modern construction and grounded lines could hardly be classed as modern. He thought, therefore, that electric companies could not be held responsible. The experience of the Cedar Rapids company has been that 6,600-volt lines cause greater trouble than 33,000 volts. Transposing every mile has also tended to reduce the trouble.

Rufus E. Lee, of Clarinda, thought that while electric companies were not legally responsible for damage to grounded telephone lines, still it is better to compromise when possible. This is being done by the Clarinda company with excellent results. In one case the cost of moving a telephone line was divided by the two companies.

J. M. Drabelle said it is often desirable to contribute to the cost, or in fact pay the entire cost when a telephone company is willing to move its lines.

Thomas Crawford, of Clinton, asked what prospects a central-station company should have before undertaking the construction of a farmers' line. Mr. Lee thought that where a line can be built to a neighboring community within seven miles, say of 500 inhabitants or over, and a 10-year street-lighting franchise obtained it would be profitable to build a line and supply the intermediate farmers. Mr. Lee outlined some of the methods used by the Clarinda company in securing business in these outlying communities.

A. L. Dodd,
President-Elect, Iowa Electrical Association.

Austin Burt, of Waterloo, described a transmissioin line built by the citizens Gas & Electric Company. This was a 10,000-volt line, seven miles long using 40-foot poles spaced 115 feet apart. No. 6 hard-drawn copper wire was used. The total yearly maintenance cost has not exceeded $25 for the ten years the line has been in operation. The total cost was $2,000 per mile.

Rufus E. Lee spoke briefly in favor of bare wire for transmission lines on account of the high comparative cost of insulated wire.

President Thomson raised the question as to whether or not the public would not eventually require insulated wire on account of safety.

A paper by A. H. Ford, of Iowa State University, Iowa City, entitled, a "Switchboard Equipment for the Parallel Operation of Alternators" was then presented. This paper will appear in a subsequent issue. An executive session was then held at which the election of officers was taken up. This resulted as follows:

President, A. L. Dodd, Charles City.

Vice-president, Rufus E. Lee, Clarinda.

Secretary, H. B. Maynard, Waterloo.

Treasurer, W. A. Mall, Belle Plaine.

The new Executive Committee is composed of A. D. Ayres, Keokuk; A. C. Ross, Carrol; and Thomas Crawford, Clinton.

A public meeting was held in the evening at which J. N. La Belle, of Chicago, presented an illustrated lecture on "The Proper Use of Reflectors." Window and interior lighting with indirect fixtures was discussed.

### Entertainment.

Extensive arrangements for the entertainment of the delegates and visitors were made by the Citizens Gas & Electric Company and citizens of Waterloo. Wednesday evening following the afternoon session automobiles were provided through the courtesy of the Town Criers Club, and trips made through the business and residential sections of the city. At night the entire party was the guest of the Electric Company at a theater party. Following this an informal smoker was held in the Citizens Gas & Electric Building.

Thursday noon, street cars were provided to convey the party to the plant of the company and at night a rejuvenation of the Jovian Order was held. Ceremonies were in charge of N. W. Lovegrove, Statesman for Iowa, and a class of 36 was initiated.

### Exhibits.

As in previous years an electric show was held in conjunction with the convention. The number of exhibits was limited on account of the small space available. Following is a brief account of the displays maintained.

Burroughs Adding Machine Company, electrically operated adding machines.

Duncan Electric Manufacturing Company, alternating and direct-current meters of all types.

W. R. Garton and Company, Appleton Electric Company's "Unilets"; Brilliant incandescent lamps; Waterbury wires and cables; Garton lightning arresters, and a line of miscellaneous railway appliances.

General Electric Company, small motors and meters. This company's exhibit was delayed enroute and did not reach the convention.

Illinois Electric Company, Bell electric motors; Peerless fans; Condit circuit breakers; Klein's lineman's tools; Holophane reflectors.

Electric Appliance Company, Ameri-

can Electrical Heater Company's heating appliances; Emerson fans, Sangomo meters; Packard transformers; and Delta-Star high-tension apparatus.

Iowa Electrical & Machinery Company, Wagner polyphase and single-phase motors; Philadelphia Electrical & Manufacturing Company's lighting specialties; Emerson fans; Columbia batteries; Sterling lamps; American heating appliances.

Julius Andrae & Sons Company, Westinghouse fans and meters; Hotpoint heating and cooking appliances; Elmo washing machines; American heating and cooking devices.

G. L. Simonds & Company, Vulcan soot cleaners; gas analysis instruments.

J. B. Terry Company, National Metal Molding fittings; Pass & Seymour fittings and sockets; Hubbel sockets; Chicago Fuse Manufacturing Company fuses; Westinghouse lamps and lightning arresters; Safety Insulated Wire & Cable Company's wire and cable; Hotpoint heating and cooking devices.

National X-Ray Reflector Company, a complete line of indirect fixtures, window-lighting reflectors and special units.

Vacuna Company, a complete line of stationary and portable vacuum cleaners

Wagner Electric Manufacturing Company, single-phase converters; alternating-current rectifiers; polyphase and single-phase motors.

Western Electric Company, vacuum cleaners; fans, both wall and ceiling type; and inter-phones.

Westinghouse Electric & Manufacturing Company, alternating and direct-current fans, motors, meters, heating and cooking devices, incandescent and arc lamps, switches, etc.

## An Interesting Patent Decision.

There was filed on April 18, in the District Court of the United States, for the Western District of Pennsylvania, a very interesting opinion by Justice Orr. This opinion is of very general interest, not only because of the technical points involved, but because of the attitude of the court with regard to the conditions under which the litigation has ensued, the far reaching results of a different opinion and the long term of years over which the litigation has progressed. It is 10 years since this patent suit was instituted in the court. At its inception two patents were involved. At the end only one was in controversy. The application for the letters patent in suit was filed in the Patent Office of the United States on November 2, 1885. On April 22, 1903, or just a little short of 17 years later, there was granted to Elihu Thomson (as assignor) in pursuance of this application, letters patent of the United States No. 698,156, for a system of electric distribution. In bringing suit on this patent the complainant was the General Electric Company, and the defendant the Pittsburgh Transformer Company under the name of the Butler Light, Heat & Motor Company. The following quotations are taken from the specification, showing to what the system relates:

"My present invention relates to means whereby electricity generated at a station and conveyed over mains or distributing circuits may be utilized at different points through the intervention of induction-coils in local circuits, each of which may be supplied with currents induced by the action of current on the main and of any desired strength or electro-motive force for each different local circuit."

"The object of the invention is principally to permit the employment of currents of comparatively high potential upon the mains leading from the supply-station to the utilization of the electric energy of the main in electric energy of lower potential in different local circuits, without, however, interrupting the continuity in any way of the electric main leading from the central station."

"My invention consists in a novel system of electric supply, comprising in combination electric mains or supply-conductors furnished from a suitable supply-station with alternating or reverse currents of comparatively high potential, induction-coils, or other suitable means for inductively transforming the alternating currents into induced currents on local circuits, said induction-coils being placed with their primaries connected at intervals to the mains, so as to be in multiple arc with one another in relation to said mains, and secondary coils or circuits connected to local circuits and properly proportioned to obtain the desired induced electric energy for operating electric lights, motors, or other electric translating devices."

The court holds that the elements distinguished in these claims were not new, and is of the opinion that in several well authenticated cases prior art and prior publicity has been demonstrated and that the patent is invalid by reason of prior publications and prior uses. It is invalid by reason of lack of patentability, novelty or invention. It is invalid by reason of the patentee's delay and laches. Quoting from the opinion, "The patent in suit rests fundamentally upon the connections of primary coils of transformers in multiple to the supply main of a reversed or alternating-current circuit. If the patent be sustained almost all lighting systems and the major part of the industry of the country, to the extent to which electricity is necessarily used therein, would be monopolized by the plaintiff."

Quoting from the opinion again, "There is one other matter that the court must touch upon. This suit lay in this court about eight years before any steps were taken on behalf of the complainant to prepare for hearing. Two years perhaps were necessary to prepare the case for final hearing. Had a motion been made to dismiss the bill for want of prosecution before 1910, the motion would have been granted. No excuse for such delay was offered by complainant's solicitor. Thirty-three years from the date of the conception of the invention to the date when the inventor brings the case to trial in which the validity of his patent is contested, seems too long."

## Ohio Students Take Inspection Trip.

About 100 students of the departments of mechanical and electrical engineering of Ohio State University were accompanied by four instructors upon an inspection trip, which occupied the week from April 20 to 27. One day was spent in Gary and Buffington, Ind., three days in Chicago, Ill., and two days in Milwaukee, Wis. The electrical students visited the plant of the Indiana Steel Company, the Sanitary District of Chicago, the Automatic Electric Company, The Western Electric Company, the tunnels of the Illinois Telephone Company, Sears, Roebuck & Company, Commonwealth Edison Company, the Pawling & Harnishfeger Company, the Allis-Chalmers Company, the Milwaukee Waterworks, the Milwaukee Gas Light Company, the Cutler-Hammer Manufacturing Company, the Milwaukee Electric Railway & Light Company, the Chicago packing houses, the Booth Fisheries Company, the Peoples Gas Light & Coke Company, and several points of minor interest.

## New York Edison Baseball Team.

The baseball team of The New York Edison Company is rounding into shape for a busy season. This fast aggregation of semi-professional players is the pennant holder of the electrical industry in the East. It came into this title last year by winning 16 out of 18 games, twice defeating the General Electric Company team at Schenectady and winning from the Brooklyn Edison Company two out of three games. The team has engaged Manhattan Field at 149th Street and Eighth Avenue, for home grounds and is open to meet any semi-professional team any Saturday afternoon this summer after June 7. All communications regarding games to be arranged, should be addressed to William J. Meara, Harlem office of the New York Edison Company, 125th Street, New York City. The manager of this year's team is Walter Ryan, who is located with The New York Edison Company at 114 West Fortieth Street.

## Preliminary Program for the Chicago Convention.

The work program for the Chicago convention of the National Electric Light Association next June is in active preparation, and can now be outlined. The convention will extend over four days, Tuesday to Friday, inclusive, June 3, 4, 5 and 6, preceded by the opening of the exhibit of apparatus and the reception of President Tait on Monday evening, June 2. There will be two sessions daily, with two and three sections in parallel operation as a general thing. On Wednesday, when the annual ball game is planned to take place, it is proposed to have the second session, as usual, in the evening. The following items and names give a list of regular reports and addresses, embracing, with the subsequent lists of papers, between 60 and 70 separate items proposed to be taken up and disposed of by the convention, although, of course, some changes may be made before the program goes into effect:

Frank M. Tait, President's Address.

T. C. Martin, Secretary's Report and Progress Report.

W. W. Freeman, Treasurer.

Wm. H. Blood, Jr., Insurance Expert.

Arthur Williams, Public Policy Committee and Library.

Frank W. Frueauff, Constitution and By-Laws.

E. W. Lloyd, Rate Research Committee.

Holton H. Scott, Membership Committee.

S. A. Sewall, Question Box Editor.

E. J. Bowers, Accounting Committee.

I. E. Moultrop, Prime Movers Committee.

Frank W. Smith, Lamps.

W. H. Fellows, Meters.

W. H. Blood, Jr., Grounding of Secondaries.

A. E. Kennelly, Electrical Measurements and Values.

Farley Osgood, Overhead Line Construction.

L. L. Elden, Electrical Apparatus.

W. H. Gardiner, Terminology.

W. L. Abbott, Underground Construction.

John W. Lieb, Jr., Street Lighting.

T. C. Martin, Memorials.

### Commercial Section.

The work of the Commercial Section will include an address by its chairman, E. W. Lloyd, and a special address on the education or training of salesmen, as well as the following reports of committees:

Finance—T. I. Jones.

Publications—Douglass Burnett.

Membership—J. F. Becker.

Electrical Salesman's Handbook—E. L. Callahan.

Electricity on the Farm—John C. Parker.

Wiring of Existing Buildings—R. S. Hale.

Ice and Refrigeration—G. H. Jones.

Electrical Merchandising—T. I. Jones.

Short Cuts in Executing Customers' Orders—G. C. Holberton.

Steam Heating—S. M. Bushnell.

Advertising—J. R. Crouse.

Education of Salesmen—George Williams.

### Hydroelectric and Power Transmission Section.

The work of this section will include an address by the chairman, W. N. Ryerson, and a special discussion by an engineer from the Bureau of Standards of the subject of life hazard in connection with the transmission and distribution of power, which the Bureau is to study next July with an appropriation of $15,000 from Congress. The committee reports to be taken up are as follows:

M. R. Bump, Receiving Apparatus.

P. M. Downing, Distributing Lines.

D. B. Rushmore, Operation of Water-power Systems.

R. J. McClellan, Membership.

T. C. Martin, Power Transmission Progress.

It is also proposed to discuss in this section the part of the report of the Committee on Prime Movers, relating to a special investigation of water-power plants and apparatus made by a sub-committee, with J. F. Vaughan as chairman. The following papers have also been prepared:

A. O. Austin, "Factors Producing Reliability in the Suspension Insulator."

R. D. Coombs, "Transmission Lines."

H. L. Cooper, "The Mississippi River Power Company's System" (illustrated).

E. E. F. Creighton, "Lightning Arresters."

Albert Kingsbury, "The New Type of Thrust Bearing."

Some attention will be given to "Conservation," but the specifically political aspects of this will be reserved for the report of the Committee on Public Policy.

### Accounting Section.

The work of the Accounting Section will include an address by the chairman of the Accounting Committee, E. J. Bowers, and the following papers and reports:

A. S. Scott, "Handling of Freight Bills."

C. S. Mitchell, "Handling of Bond Coupons."

F. E. Stevens, "Accounting for Replacement of Plant Retired from Service."

F. Heydecke, "Method of Keeping Prepaid and Accrued Accounts."

Alexander Holme, "Accounting Schools and Education of Employees."

H. B. Lohmeyer, "Office Mechanical Appliances."

F. H. Patterson, "Obligations of the Bookkeeping to the Operating Department."

W. E. Freeman, "Pay-Roll Problems."

J. L. Bailey, "Report on the Revised Standard Classification."

H. Spoehrer and C. L. Campbell, "Joint Report on Statistics and Forms."

The Committee will in addition present a report which will summarize with the papers of this year all the papers presented before the section in previous years, so that members can find all these useful reference data in one document. The Committee will also submit and report upon a new collection of several thousand forms and blanks in use by member companies in their accounting systems.

### Miscellaneous Papers.

The program includes a good deal of miscellaneous work, and many papers which will either be taken up in the Technical Sessions or treated in the General Sessions, or allotted to the sections within which they would naturally fall. An address is hoped for from President Insull, of the Commonwealth Edison Company, on recent features of central-station evolution; and it is also hoped to secure for presentation data on the huge new turbo-alternators ordered from England for the Chicago system. A list of the proposed papers follows:

Paul Lupke, "Anticipation."

W. A. Thomas, "Central-Station Power in Coal Mines."

Paul MacGahan, "Switchboard Instruments."

E. P. Dillon, "Railway Loads for Central Stations."

H. H. Rudd, "Transformers and Power Transmission."

W. A. Darrah, "Arc Lamps and Recent Developments Thereof."

J. N. Mahoney, "Developments in Protective Apparatus."

E. G. Reed, "Latest Developments in Distributing Transformers."

R. E. Campbell and W. C. Cooper, "The Incandescent Lamp and Its Relation to Lighting Service."

J. E. Randall, "New Incandescent Lamp Development."

Angus S. Hibbard, "Use of the Telephone in Central Stations."

R. A. Griffin, "Poles and Pole Preservation."

E. B. Merriam, "Switching Apparatus for Rural Installations."

J. Edward Kearns, "Central Stations for Towns of 5,000 Population or Less."

T. K. Stevenson, "Advantages of

Copper-Clad Wire for Series Arc Lighting."

One or two items may still be added, but it will be seen that the program is full of attractive and interesting features.

There will be a special session devoted to the work of the Company Sections, or it will be given prominence in a general Session. The proposal has also been made to have a special discussion devoted to the recent remarkable development of the holding company method, and the ways in which, through it, the efficiency of the industry and improved service to the public can best be secured. One or two leading men have already intimated their willingness to contribute to the discussion of this subject, if it can be arranged.

One notable feature of the convention will probably be the invitation issued to public-service commissions to attend the convention and assist in its deliberations. It is felt that in this way the industry and the regulating authorities can be brought into closer harmony in regard to many subjects now involved in confusion and difficulty, but in regard to which there must be joint action. The plans of the new Society for Electrical Development will also be presented by one of its leading officers.

### Transportation Arrangements.

Reduced fares have been authorized to Chicago by the Transcontinental Passenger Association, Western Passenger Association, Southwestern Passenger Association, Trunk Line Association, Central Passenger Association and Southeastern Passenger Association. The New England Passenger Association and the Eastern Canadian Passenger Association have not granted reduced fares for this occasion. In order to secure the low fares authorized for this meeting, it is imperative that round-trip tickets be purchased, as no reduction will be allowed on one-way tickets. Special arrangements may be made for stop-over and extra trips, and tickets will be sold on convenient dates upon application to the local agent.

The following special trains have been arranged:

Train No. 1, Red Special, leaving Grand Central Terminal, New York, Sunday, June 1, 1:00 p. m. This train will be under the personal direction of F. H. Gale, General Electric Company, Schenectady, N. Y., assisted by R. D. Lillibridge, 111 Broadway, New York City.

Train No. 2, Pink Special, from the Pennsylvania Terminal, New York, leaving Sunday, June 1, 10:00 a. m. This train will be under the direction of J. C. McQuiston, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., assisted by A. H. Manwaring, Philadelphia Electric Company, Tenth and Chestnut Streets, Philadelphia.

Train No. 3, Golden Poppy Special, Oakland Station, San Francisco, Cal., leaving Thursday, May 29, at 8:30 a. m. This train will be under the personal direction of E. B. Strong, *Journal of Electricity, Power and Gas,* Rialto Building, San Francisco.

Train No. 4, Maroon Special, leaving Kansas City *via* Acheson, Topeka & Santa Fe Railroad, Sunday, June 1, 7:00 p. m. This train will be under the personal direction of E. J. Bowers, Kansas City Electric Light Company, Kansas City, Mo.

Train No. 5, Purple Special, leaving Union Station, St. Louis, *via* Chicago & Eastern Illinois Railroad, Sunday, June 1, at 10:00 p. m. This train will be under the personal direction of H. Spoehrer, Twelfth and Locust Streets, St. Louis.

Train No. 6, Magnolia Special, leaving Atlanta, Ga., *via* Southern Railway, June 1, at 8:30 a. m. This train will run under the special auspices and management of the Southeastern Section of the National Electric Light Association, whose officers have formed a committee which is in touch with every member in that territory.

It is imperatively essential for the comfort and convenience of the members attending the convention and for the success of the arrangements of the special trains that immediate attention be given by everybody to securing the accommodations desired. The chairman of the transportation committee is G. W. Elliott, *Electrical World,* 239 West Thirty-ninth Street, New York.

## Record Head for Hydroelectric Project.

In the Canton Wallis, Switzerland, a water power having a head of 5,412 feet is to be developed near Martigny. This stream forms the outlet of the Lake of Fully. The project has been designed by a civil engineer of Lausanne, M. Boucher.

The turbines are rated at 15,000 horsepower and will be built by Piccard, Pictet and Company, of Geneva. The contract for the pipe line has been given to Thyssen and Company, of Muelheim, Germany. The pipe line forms one of the most interesting features of this project, as it must be constructed to withstand a pressure of 2,425 pounds per square inch at the lower end. The total length of the pipe line is 2.75 miles. The upper section will be of the lapwelded type, whereas the lower portion will be seamless. The thickness of the pipes will vary up to 1.8 inches and the inside diameters are from 19.7 to 23.6 inches.

## BOOK REVIEW.

"The Induction Motor." By Benjamin F. Bailey. New York: McGraw-Hill Book Company. Cloth, 225 pages (6x9 inches), illustrated. Supplied by the Electrical Review Publishing Company for $2.50.

The object which Dr. Bailey had in view when he prepared this treatise on the induction motor was to present the physical aspects of the actions and reactions going on in the motor rather than to deduce a large number of mathematical expressions representing the same facts to those who could properly interpret them. This plan he has faithfully followed so that a marked feature of this book in comparison with most other writings on the induction motor is the absence of mathematical expressions. The reactions are explained by means of diagrams and the physics of the motor which is, in fact, the important phase of all electrical apparatus, for students at least, he carefully explains in detail. This does not always make easy reading, but after the student has mastered the argument he will certainly know more about the induction motor than had he learned by rote the processes of developing a series of algebraic expressions standing for the same relations. The author does not limit himself merely to the induction motor but describes also the starting apparatus and the uses of the motor for other purposes, such as the induction generator and frequency converter. He gives also a valuable chapter on variable-speed induction motors, including those of the commutator type, and in the concluding chapter of the book he deals with the single-phase induction-repulsion motor. The method of determining the constants necessary for constructing a circle diagram is explained and the use of this in predicting the performance of any motor is shown. He discusses the question of design as affected by frequency, the shape of the slots, the effect of various windings and gives an example of the design of a motor. Some of the special types of motors are described.

The typography in general is good, although an unpleasant number of broken letters and an occasional slip in the drawing of a diagram occurs. Taken at a whole this book is a welcome addition to the literature of the induction motor, but it requires some knowledge of alternating currents to enable one to follow the argument, and hence is recommended for advanced study of induction motor rather than as the introduction to this subject.

W. Hand Browne, Jr.

## Ozone Preserves Meats.

**Electrically generated ozone is used for preserving meats in Germany.**

## General Electric Company Annual Report.

The report of President Coffin to the stockholders of the General Electric Company, dated April 21, 1913, for the year ended December 31, 1912, is as follows:

| | | |
|---|---|---|
| Profits from sales | | $ 8,107,993.55 |
| Income from other sources | | 5,002,829.89 |
| | | $13,110,823.44 |
| Less interest and discount on debenture bonds | $ 532,087.18 | |
| Dividends paid | 6,213,173.92 | 6,745,261.10 |
| Carried to surplus account for the year | | $6,365,562.34 |
| The value of orders received during the year was | | $102,934,788.00 |
| The amount of sales billed for the year was | | 89,182,185.80 |

The foregoing statements include for the first time the business formerly conducted by the Fort Wayne Electric Works, the Sprague Electric Company, and the National Electric Lamp Company.

The Fort Wayne Electric Works and the Sprague Electric Company were dissolved and their business merged with that of the General Electric Company during 1911, while corresponding dissolution and merger of the National Electric Lamp Company was effected during 1912.

The competition referred to in last year's report has continued to increase in severity, with the result that the percentage of profit realized from the sales of your apparatus has materially diminished.

The manufacturing facilities of your company have been substantially enlarged in order to provide for the increasing volume of business. The factory floor area is shown as follows:

| | Square Feet |
|---|---|
| 1908 | 7,000,000 |
| 1909 | 7,180,000 |
| 1910 | 8,530,000 |
| 1911 (including Fort Wayne, Erie and Sprague) | 9,770,000 |
| 1912 (including National Lamp Works) | 12,160,000 |

The growth and extent of your company's interests and operations is evidenced by the number of employees in your factories, offices and subsidiary companies, the total number of such employees being in excess of 60,000.

The number of orders received during the year was 466,895, exclusive of the Fort Wayne, Sprague and National Lamp departments. This represents a steady and nearly uniform increase, the number of orders received in 1907 having been 237,006.

The expenditure of $539,956.93 during the year for the purchase of patents, for applications and licenses under patents and for miscellaneous patent expense, has been charged to Profit and Loss, and the patent account remains at $1.

The stocks and bonds owned by your company have a par value of $23,013,764.54 and are carried at a book value of $23,325,070.38 at December 31, 1912. The principal change from last year is the transfer into the various asset accounts of the General Electric Company of its investment in the National Electric Lamp Company.

The book value of current accounts and notes receivable was $26,950,244.90 on December 31, 1912, after making ample provision for possible losses. Of the accounts receivable only $558,224.92 represents the face value of unsettled accounts originating earlier than January 1, 1912. From affiliated, manufacturing and selling companies there was due a total of $4,099,062.64, making a total book value of all accounts and notes receivable of $31,049,307.54.

| | | |
|---|---|---|
| On January 31, 1893, the book value of the Schenectady, Lynn and Harrison plants was | | $ 3,958,528.21 |
| During the twenty fiscal years to December 31, 1912, expenditures have been made, including the cost of the Pittsfield, Erie, Fort Wayne, Sprague and National Lamp plants, aggregating | | 57,941,511.78 |
| Total | | $61,900,039.99 |
| Written off during the twenty years | | 37,343,929.40 |
| Book value of above plants at December 31, 1912 | | $24,556,110.59 |

A summary of the changes in factory plants account since the last annual report is as follows:

| | Net Book Value Jan. 1, 1912 | Additions During Year | Written Off | National Lamp Works | Net Book Value Dec. 31, 1912 |
|---|---|---|---|---|---|
| Real estate, buildings | $11,933,028.24 | $2,224,974.64 | $ 772,197.66 | $1,993,317.51 | $15,379,122.73 |
| Machinery | 7,605,891.06 | 3,198,952.25 | 2,628,738.76 | 1,000,881.31 | 9,176,985.86 |
| Patterns | 1.00 | 93,255.31 | 93,255.31 | ..... | 1.00 |
| Furniture, fixtures | 1.50 | 551,787.72 | 551,788.22 | ..... | 1.00 |
| | $19,538,921.80 | $6,068,969.92 | $4,045,979.95 | $2,994,198.82 | $24,556,110.59 |

On July 25, 1912, the Board of Directors authorized an issue of $60,000,000 forty-year debenture bonds to be sold from time to time as required. Pursuant to this authority, there have been sold $10,000,000 of these debentures bearing interest at the rate of 5 per cent per annum.

During the year the capital stock of your company has been increased by the conversion of $510,000 of the gold debenture bonds of 1907, and also by the issue of $2,500 of capital stock in exchange for $3,000 of the debentures of 1892.

For the purpose of recouping the stockholders in part for dividends passed or reduced during the years 1893 to 1902, the Board of Directors on October 11, 1912, declared a stock dividend of 30 per cent out of surplus.

| | | |
|---|---|---|
| The capital stock of your company as of January, 1912, amounted to | | $77,335,200.00 |
| During the year additional stock was issued: | | |
| In exchange for debentures of 1892 | 2,500.00 | |
| In exchange for debentures of 1907 | 510,000.00 | |
| Stock dividend | 23,354,300.00 | |
| Total capital stock issued | | $101,202,000.00 |
| Reserve against $35,000 debentures of 1892, convertible at 120 | 29,166.67 | |
| Reserve against $211,000 debentures of 1907 convertible at par | 211,000.00 | |
| Unissued and unappropriated | 3,557,833.33 | |
| Total capital stock | | $105,000,000.00 |

Quarterly dividends at the rate of 8 per cent per annum have been paid during the year.

The company has no note payable, neither is there any paper outstanding bearing its endorsement.

It is an ever-increasing pleasure to testify to the ability and fidelity of the members of the administrative, engineering, manufacturing and commercial staffs, and the splendid spirit of cooperation which they have always shown in connection with the company's affairs.

CONDENSED PROFIT AND LOSS ACCOUNT.
December 31, 1912.

| | | |
|---|---|---|
| Sales billed | | $89,182,185.80 |
| Less: Cost of sales | | 81,074,192.25 |
| | | $ 8,107,993.55 |
| Interest and discount, royalties and sundry profits | $1,292,224.20 | |
| Income from securities owned | 1,241,256.72 | |
| From increase in value of securities of companies owned, due to the increase in the surplus of those companies for the year; and profit on securities sold | 2,469,348.97 | |
| | $5,002,829.89 | |
| Interest and discount on debenture bonds | 532,087.18 | |
| | | 4,470,742.71 |
| | | $12,578,736.26 |
| Dividends paid | | 6,213,173.92 |
| Net surplus for the year | | $ 6,365,562.34 |
| Surplus at January 1, 1912 | | 29,019,892.52 |
| | | $35,385,454.86 |
| Less: Stock dividend | | 23,354,310.00 |
| Surplus at December 31, 1912 | | $12,031,144.86 |

## Relative Earnings of Securities.

The firm of Henry L. Doherty & Company, New York bankers, has issued another group of charts illustrating the relations of public-utility securities, railroad securities and industrial securities.

The intrinsic merits of one class of securities as compared with another are dependent first on the relative safety of the principal invested and second on the relative earnings.

Fig. 1 shows the way the capital issued by these three groups of companies has increased during a period of ten years, the way the net earnings on this capital have varied during the same period, and the net earnings per $100 of securities outstanding. As these figures include all of the railroads of the United States, all of the large industrials listed on the New York stock exchange during this period and most of the large gas and electric companies, they warrant some detailed consideration.

It is surprising to learn that during the last decade the railroad capital outstanding has increased by over one-half the total amount outstanding prior to 1902; but it is still more surprising to realize that during the same period gas and electric companies have doubled their capitalization.

The second section of Fig. 1 shows that while industrials and steam railroads are subject to quite marked fluctuations in the amounts of their net earnings, the net earnings of gas and electric companies have increased

steadily, even through such periods of depression as followed the panic of 1907.

The third section shows that the net earnings of the steam railroads per $100 of stocks and bonds outstanding have been fairly steady, falling below $4.00 only in 1908, and averaging $4.25 for the entire period.

The net earnings of industrials per $100 of industrial securities outstanding have fluctuated between 5 and 10 per cent, but on the other hand they have averaged $7.79 as against only $4.25 for the railroads.

In view of these net earnings per $100 it is extremely interesting to note that all the stocks of all railroads listed on the New York stock exchange are selling at an average of something over $125 per share, while those of public utilities are selling over $90. The immediate inference might be that public-utility stocks are much less secure than are those of the railroads, whereas the reverse is the case. Public-utility securities sell at lower prices in spite of their high safety and high earnings, merely because they have not been as popular as railroad securities.

In the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of March 15 diagrams were given showing in detail the relative security of these different classes of securities. Deductions were drawn from a review of the equivalent of $545,310,371,443 of capital, during the 30 years from 1882 to 1912. Of this vast sum $9,578,713,793, or 1.75 per cent had been in receivers' hands.

It was shown that for every $100 of railroad securities outstanding $1.84 averaged to be in receivers' hands. For the larger industrials this figure appears as $2.07, whereas for gas and electric securities outstanding it is but 37 cents, and this in spite of the high net earnings of these latter, amounting to an average of $8.45 per $100.

Studies of conditions in this country for thirty years show conclusively that high earning rates are not necessarily indicative of insecurity of capital, for curiously enough the gas and electric group which has the least loss of capital (37 cents per $100) has also the highest net earnings per $100 ($8.45), as indicated in Fig. 2. When the general public realizes that as a group, public-utility securities are safer than railroad securities these public-utility securities will surely become more popular than railroad securities.

The first effect of this increasing popularity of public-utility securities would be an enhancement in the market value of issues now outstanding, which would profit those who have invested in them. But the ultimate effect of this increasing popularity, due to a realization of relative intrinsic values, will be that public utilities will be able to finance their future extensions at very much lower rates than they now have to pay. In other words, it is today disproportionately expensive to get the additional capital necessary to increase the facilities of public utilities demanded by the growth of the service to the public; but by the investing public realizing the real merits of public-utility securities, the costs of getting additional capital to meet extensions will be much reduced, and this will profit the communities served by giving them a broader and better service at a lower cost.

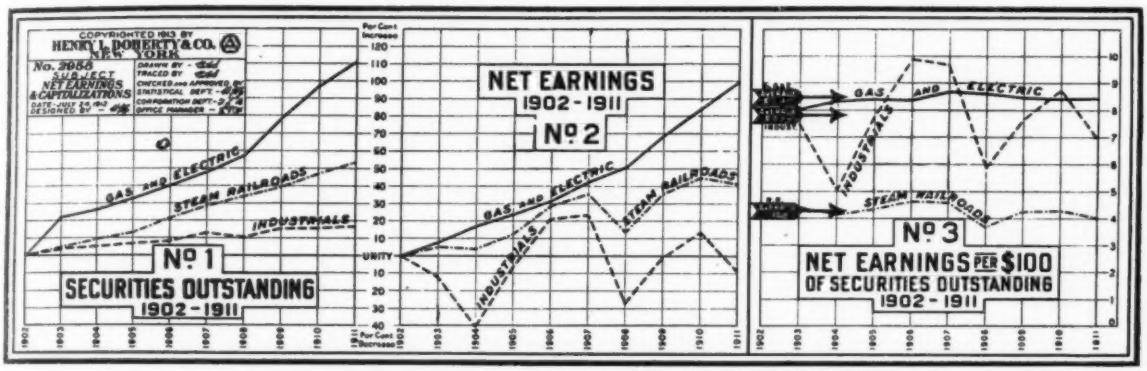



Fig. 1.—Securities and Earnings of Railroads, Other Utilities and Industrial Corporations.

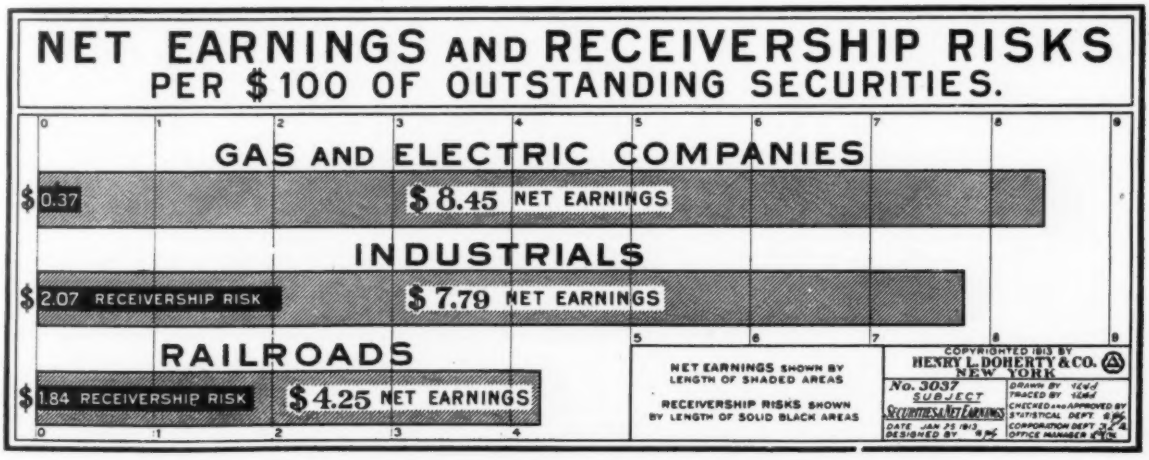

NET EARNINGS AND RECEIVERSHIP RISKS PER $100 OF OUTSTANDING SECURITIES.
GAS AND ELECTRIC COMPANIES
$0.37
$8.45 NET EARNINGS
INDUSTRIALS
$2.07 RECEIVERSHIP RISK
$7.79 NET EARNINGS
RAILROADS
$1.84 RECEIVERSHIP RISK
$4.25 NET EARNINGS
NET EARNINGS SHOWN BY LENGTH OF SHADED AREAS
RECEIVERSHIP RISKS SHOWN BY LENGTH OF SOLID BLACK AREAS
COPYRIGHTED 1913 BY HENRY L. DOHERTY & CO. NEW YORK
No. 3037 SUBJECT SECURITIES & NET EARNINGS

Fig. 2.—Net Earnings and Receivership Risks of Industrial and Utility Corporations.

Practically all of the old tramway lines operated by steam and compressed-air locomotives in Paris, France, are being converted into electric street railways.

# New Electrical and Mechanical Appliances

## Largest Electric Mine Hoist in the World to be Built by American Company.

The following interesting facts are from a report submitted by United States Consul Edwin N. Gunsaulus, of Johannesburg, South Africa.

One of the largest and most important electric contracts recently awarded in connection with the Witwatersrand gold-mining industry is that just received by the General Electric Company, of New York, through its subsidiary company, the South African General Electric Company, of Johannesburg, for supplying to the Crown Mines, Limited, the largest electric mine hoist in the world and, in fact, the largest hoist of any kind whatever which has ever been ordered.

The hoist, which is to be supplied by the Schenectady shops of the General Electric Company, will raise 16,000 pounds of ore per trip in a vertical shaft 3,540 feet deep at a speed of 3,500 feet per minute. The weight of the empty ore bucket (or skip) is 8,700 pounds. The rope is two inches in diameter, weighing 6.4 pounds per foot.

The hoist will consist of two cylindro-conical drums, of which the smaller diameters are 12 feet and the larger 20 feet 8 inches. The speed of the drums will be 53.5 revolutions per minute. To either end of the drum shaft there are connected two direct-current, separately-excited electric motors, designed for 500 volts, and each capable of giving continuously an output of 2,000 horsepower at 53.5 revolutions per minute.

The total weight of each motor will be approximately 142,000 pounds, exclusive of shaft and bearing. These two hoist motors will receive their power from a motor-generator set, which converts 50-cycle, three-phase current to direct current.

The motor-generator will consist of one 5,000-horsepower (continuous rating), three-phase, 50-cycle, 2,000-volt induction motor, operating at 375 revolutions per minute, direct coupled to two 1,650-kilowatt, separately-excited, direct-current generators. There will also be one 60-kilowatt, shunt-wound exciter for exciting the fields of the two hoist motors and the two direct-current generators. The control will be on the Ward Leonard system. While the capacity of the motor-generator set is equivalent to 5,000 horsepower continuously, the intermittent output from the hoist motors may be at times 9,000 horsepower, and the corresponding input to the motor-generator set approximately over 11,000 horsepower.

The total weight of the motor-generator set will be approximately 138,000 pounds, while its over-all dimensions will be approximately as follows: length, 30 feet; width, 11 feet 6 inches; height, 10 feet 3 inches. The dimensions of the hoist-motor armatures are so great as to make their transportation over the South African railways impossible, and it will therefore be necessary to assemble and wind them on the spot. It is understood that the contract price for this electric hoist is approximately $125,000.

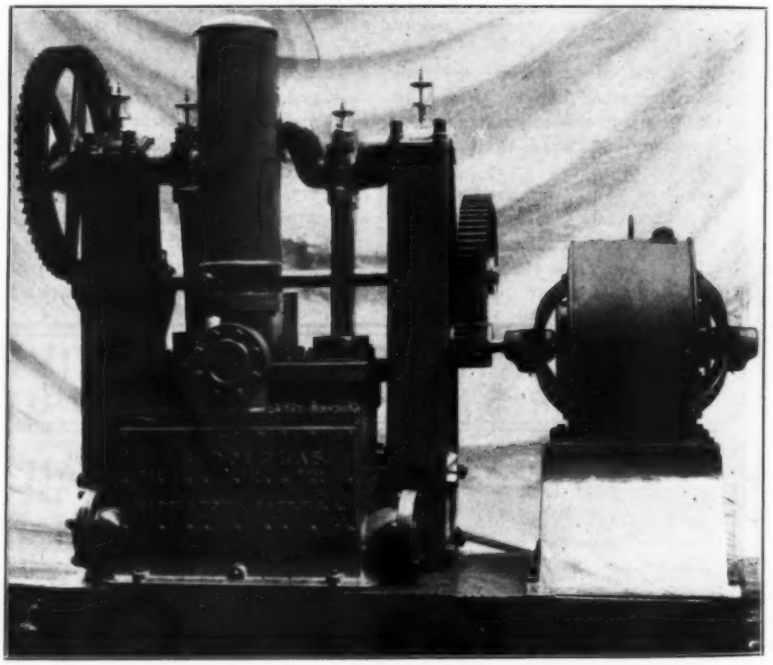
## Emergency Motor-Driven Pumps for Theaters and Auditoriums.

The fear of fire in a theater or public hall has given rise to an advertising asset, safety for patrons, which is being used to great advantage by the owners of those auditoriums that have installed fire-fighting and preventive apparatus in excess of the rules laid down by the fire departments and underwriter boards of various localities.

Notable installations of fire-fighting apparatus are installed in the Alhambra Theater, New York City, and the Orpheum Theater, Brooklyn.

The illustration shows one of these duplicate sets which consists of a 25-horsepower motor manufactured by the Diehl Manufacturing Company, of Elizabeth, N. J., and a duplex pump manufactured by W. & B. Douglas, Middletown, Conn. The motor is fitted with a special form of automatic controller which places the pump in service at a moment's notice.

These outfits are used to keep the pressure in the fire lines at all times so that in case of an emergency the appliance may be used prior to the arrival of the fire department. They deliver 250 gallons of water per minute with 50 turns of the crank shaft and are working against a pressure of 100 pounds.



Motor-Driven Fire Pump for Theaters.

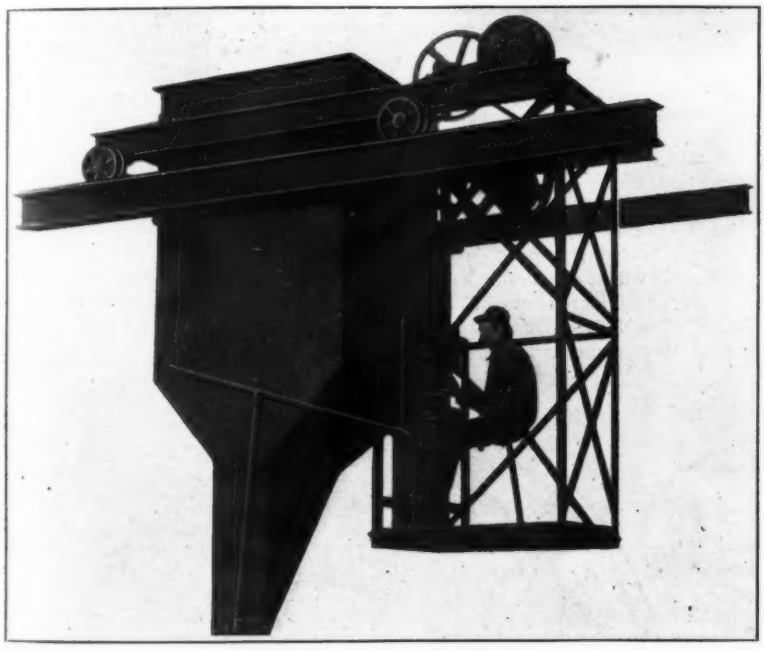
A single-phase railway with a trolley potential of 15,000 volts has been put into successful operation in the neighborhood of Shopfheim, Germany. This electrification covers about 30.5 miles on which 12 electric locomotives are used.

## Economical and Flexible Motor-Driven System for Delivering Coal to Boilers.

Motor-driven coal hoppers, which can take coal from bunkers located anywhere and deliver it to any boiler in a battery, are coming more and more into favor. Their use does away with the system of overhead bunkers and individual chutes for each boiler, and permits all the coal to be concentrated in one bunker instead of in a series of pockets.

The bunkers can be placed at one end of the boiler room or, for that matter, outside if necessary, so that the boiler room can be designed and located with greater freedom and plenty of space can be left above the boilers for light and air.

This system is also frequently preferred to conveyors because it is cleaner, less liable to break down, cheaper in first cost, and does away with the difficulty of taking care of the surplus or overflow which a conveyor will carry on to the end after the intermediate discharge gates are closed.



Motor-Driven Coal Hopper.

The hopper runs on a trackway parallel to the front of the boilers and is controlled by an operator in the same manner as an overhead crane. Accurate scales on the hopper make it possible to keep a precise record of the fuel burned by any boiler. If desired, a recording device can be installed so that a printed record of the weight of every discharge can be made by the operator. The hopper runs under the bunker and is filled by the operator, the scales indicating when the hopper is full. It is then run into the boiler room and delivers coal where wanted.

The hoppers are manufactured by the Bergen Point Iron Works, Bayonne, N. J., and Westinghouse motors are used to propel them.

## Tidnam Reinforced-Concrete Hollow Poles.

The increasing cost of good pole timbers for all kinds of overhead electric wire lines is directing attention more and more to an effective substitute for wood for this purpose. Steel poles have been recommended and for high-tension power lines they have been extensively employed. For distribution lines and for all low-tension circuits, however, they are not desirable because of their need of frequent inspection and repainting to guard against rusting. Concrete poles are therefore the only kind that can be employed where permanency and low maintenance cost are of prime importance.

Many types of concrete poles have come into use. All have steel reinforcements imbedded during construction to give them great power to resist bending or cracking. An objection to some types of concrete poles is their great weight, which increases their cost of shipment and erection.

This objection has been met through the invention by Frederick H. Tidnam of an ingenious method of molding hollow concrete poles. These can be made to any desired section and length. A hollow pole 25 feet long 7 inches thick at the top and 16 inches at the butt is cored out by the Tidnam process to have a wall thickness of 2.5 inches; such a pole has a total weight of 2,460 pounds and when set six feet in the ground will easily sustain a side pull of 1,000 pounds at the top. The pole is reinforced by means of 12 one-quarter inch deformed high-carbon steel rods. Additional strength can be readily obtained by using a little more steel reinforcement in the lower part of the pole. A pole of the dimensions referred to can be made with the following amounts of material: 12 cubic feet of half-inch stone, 8 cubic feet of sharp sand, 3 cubic feet of cement, 430 feet of one-quarter-inch steel reinforcement.

The poles are made in a specially constructed mold with a telescopic core. One pole can be made each 24 hours with one mold. The poles can be made on the ground or at a central point and shipped to the place of erection after they have thoroughly hardened. Iron steps can be provided in the pole, if desired, and holes left for bolting any number of cross-arms. By adding or taking off a section of the molds the length of the poles is made to suit any condition. The poles are erected like wooden poles.

These concrete poles have a neat appearance, even in the ordinary gray finish. If desired, a granite or other colored surface layer and other ornamentation can be provided in molding. If well set, the poles remain in perfect alinement and are not affected by even very severe storms. The poles are fireproof and insectproof and not subject to decay. No maintenance is required. The hollow core in the pole can be used to connect underground to overhead wires.

Tidnam poles have been installed with complete success in many cities for carrying electric light, power, street-railway, telephone and telegraph lines. The Tidnam patented process for their production is controlled by the National Reinforced Concrete Corporation, Monadnock Building, San Francisco, Cal.

## Aluminum Cables for Paris Street Railways.

A recent consular report states that the Paris Omnibus Company, which is changing its street-railway lines to electric traction, has placed an important contract for aluminum armored cables for the feeder networks. The cables will have cross sections up to 1,000 square millimeters (1.55 square inches), and are for a pressure of 500 volts. The order comprises some 300 tons of metal, and is expected to show an economy of 8 to 10 per cent as compared with the cost of copper cables.

## Bristol's New Float-Type Recording Differential-Pressure Gauge.

An illustrated article was published in these columns in the issue of April 5, 1913, describing the spring-pressure-tube designs of recording differential-pressure gauges as made by the Bristol Company, of Waterbury, Conn. This company is now putting on the market another invention of its president and founder, Prof. Wm. H. Bristol.

This new float-type differential recorder, Fig. 1, was patented August 15, 1911, and has been tested under practical operating conditions in steel works. It was developed to meet requirements for which the spring-pressure types of differential recorders are not suitable, that is for very low ranges of differential pressure in air, gases, liquids or steam, for applications where the static and differential pressure fluctuates rapidly, and also to satisfy the demand for instruments to record the rate of flow or volume directly on charts having uniform graduations in any desired units either of flow or of volume.

The construction and principle of operation of the instrument will be readily understood by referring to Fig. 2. There are two pressure chambers *A* and *B* intercommunicating through the connection *C*. A cylindrical float *D* is located in the pressure casing *A* as indicated, and is connected by arms to the shaft *F*, which extends through the casing. The recording arm *G* is

Fig. 1.—Bristol's Float-Type Recording Differential-Pressure Gauge.

by a special clockwork at the desired speed.

By making the cross sections of the pressure chamber *B* of certain proportions as indicated, it is possible to produce a scale whose graduations are uniform for equal increments of flow or volume. The Bristol-Durand radii-averaging instrument can therefore be used to obtain total flow or volume from the chart record of this instrument for a period of 24 hours.

As these gauges will operate on extremely low differential ranges they are particularly well adapted for use in connection with Pitot tubes for recording volumes of liquids, air or other gases.

Fig. 3 is a reduced reproduction of a 24-hour record of the flow of blast-furnace gas, made by one of these instruments in connection with Pitot tubes, at one of the largest blast furnaces in the United States. It will be noted that this chart is graduated in thousands of cubic feet of gas per hour, the range being from 0 to 500,000 cubic feet per hour. The working part of the chart above 150,000 is provided with uniform volume graduations. The actual differential pressure for the total range of the chart shown was 0 to 1.46 inches head of water. From this it will be seen that with a simple, inexpensive Pitot tube it is possible to obtain sufficient differential pressures at slow rates of flow to directly record the amount and variations of the volume.

This instrument may be used to record the head of water in tanks under varying pressures as, for instance, height of water in steam boilers and condensers. Another special application is that of recording the flow of water through a notch or over a weir, even though liquid is under pressure or a vacuum.

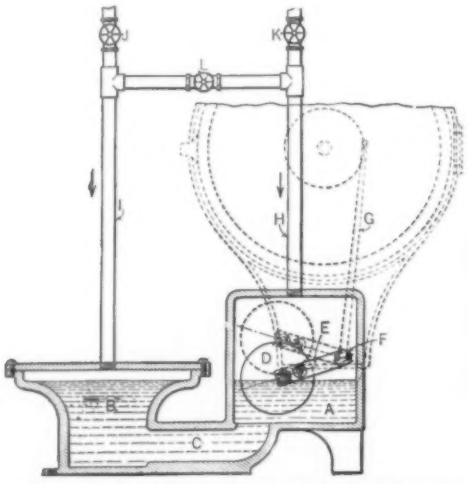



Fig. 2.—Sectional Diagram of Differential-Pressure Gauge.

directly connected to the end of shaft *F*.

Connections are made by means of the pipes *H* and *I* between the pressure chambers *A* and *B* and the two pressures whose difference it is required to record. Mercury or water are employed in the pressure chambers, according as the differential range to be recorded is high or low. When the higher pressure is applied to the chamber *B* through the pipe *I*, the level of the liquid in this chamber is lowered and that in the float chamber is raised, carrying the float and the attached recorder arm with it and making a record on a circular chart as it is revolved

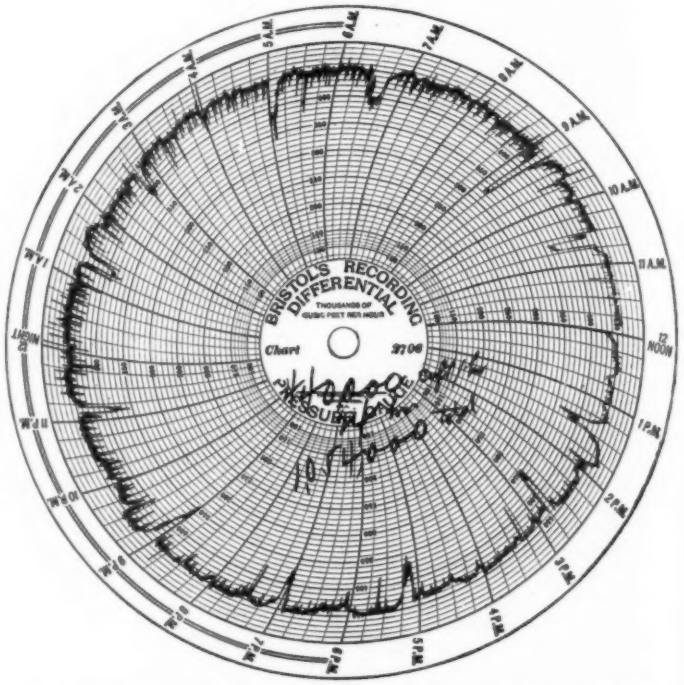



Fig. 3.—Chart Taken from Differential-Pressure Gauge Recording Rate of Flow of Blast-Furnace Gas.

## Phenixlite Semi-Indirect Fixture.

A new type of lighting fixture belonging in the semi-indirect class has been put on the market by the Phoenix Glass Company, 15 Murray Street, New York City. It is of simple design and said to be highly efficient. It is particularly suited to any installation where the many advantages of semi-indirect lighting are desired regardless of the height or the color and condition of the ceilings. As shown in the accompanying illustration of the Phenixlite, as the new fixture is called, it consists of two glass reflectors. Of these the upper is a wide dome of Pheno, an opal glass of light density; the lower is a smaller and denser inverted reflector made of beautiful pearl-white Marbo glass. All the surfaces on these reflectors are smooth so that dust does not accumulate so rapidly and the glass can be easily cleaned.

Phenixlite Unit.

The construction is such that the socket for the single pendent lamp used is near the center of the dome or upper reflector. A simple two-armed holder is supported from the shoulder of the socket and passing on opposite sides of the lamp holds the lower reflector in place. What light passes through the lower reflector is thoroughly diffused. The bulk of the light that strikes the inner surface of this reflector, however, is thrown upward against the dome reflector and there reflected downward into useful directions. Much direct light from the lamp also follows this course. Relatively little light passes through the dome, but what does illuminates the ceiling and upper part of the room, thus giving an aspect of cheerfulness to the entire interior.

It will be noticed that the dome serves also to protect the inverted reflector from much of the dust that would accumulate in it if it were entirely exposed. The main function of the dome, however, is to act as an artificial ceiling, which feature makes the fixture adaptable to interiors in which the ceiling is not suited to indirect or semi-indirect lighting.

## Insulate Hard-Rubber Substitute for Electrical Purposes.

A very useful insulating compound that can be made into any desired shape has been placed on the market by the General Insulate & Machine Company, 1010 Atlantic Avenue, Brooklyn, N. Y., under the trade name Insulate. It has the desirable properties of hard rubber, but not its disadvantages. Electrically and mechanically it possesses great strength. It takes a fine polish. Fine ridges and threads and sharp edges can be provided in objects made of this material.

The manufacturer has a large machine shop for making accurate dies and tools used in molding Insulate objects. A great variety of seamless telephone-receiver cases, transmitter mouthpieces, insulating handles and knobs, switchboard terminals, etc., are made from Insulate. A few are shown herewith. Metal parts are readily imbedded in the material. In all cases the objects are carefully molded and well finished. They are all tough and durable.

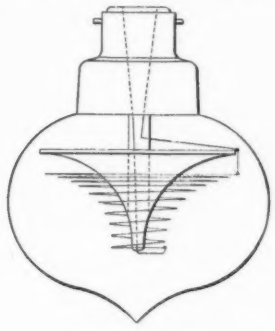
Samples of Insulate Products.

## Automatic Telephone System to Be Installed in Buffalo.

The Federal Telephone & Telegraph Company, of Buffalo, N. Y., has decided to re-equip its entire Buffalo exchange system with automatic telephone apparatus. The company is one of the largest independent companies in the country and has a total of about 65,000 subscribers in western New York, of whom about 22,000 are in the city of Buffalo. An initial order for automatic equipment for about 17,000 of the latter lines has been placed with the Automatic Electric Company, of Chicago. The present manual equipment is of modern type and in good condition, having been installed within the last 12 years when the company was organized. However, the Buffalo independent exchange is a very busy one, the average number of calls per line per day averaging over 20, which is said to be a traffic that can not be handled manually with the best degree of success from the modern service standpoint. The Federal company is convinced that the new automatic equipment will greatly increase the speed and general efficiency of the service and meet with the hearty approval of its subscribers, a great many of whom have already indorsed the change after inspecting an automatic telephone exhibit in the office of the company. The addition of a calling dial on each instrument will be practically the only change necessary on the subscribers' premises. It is hoped to have the entire Buffalo exchange system working automatically by the close of this year.

## A New Electric Lamp.

William Fuhrkop, of Calcutta, India, has been granted Ceylon patent No. 1,294 for a new electric lamp. The adjoining illustration will help to convey the idea which the inventor has in mind. In the interior of the bulb there is a specially shaped reflector in close proximity to which is wound a drawn-wire filament. The leading-in wire for this enters at the apex of the reflector, and leaves at a convenient point at its circumference. The drawing does not explain how the reflector is attached to the lamp cap or of what material it is constructed, but the inventor claims that the greater part of the light is utilized in a useful manner, and that there is a considerable economy of current. It is stated that arrangements have been made for taking out patents in the principal civilized countries, and licenses are offered on favorable terms. The address of the inventor is 19 Esplanade Mansions, Calcutta, India.

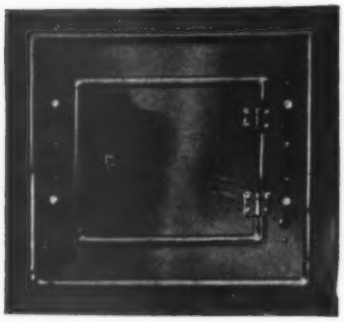


Reflector Lamp.

## Columbia Push-Button Switch Cabinets.

When switch cabinets equipped with knife switches of the ordinary type used for lighting circuits are installed in places where inexperienced or careless persons manipulate the switches, the result sooner or later is loosening and breaking apart of switch parts with attendant troubles. The exposing of live switch blades or other conducting parts is also not desirable under these circumstances. Therefore, for such locations in place of the common slate panel boards with knife switches, there have been put on the market steel cabinets with push-button switches. This type of switch is regarded by many as the best suited for lighting circuits, both on account of its good mechanical construction that permits it to break and make the circuit more quickly and better and many times in excess of that possible by a knife switch, and because it eliminates the danger of exposed live parts.

In the line of switch cabinets illustrated herewith, plug cutouts are



Push-Button Switch Cabinet.

Switch Cabinet With Cutout Compartment Open.

grouped on standard bases in the central compartment, which is provided with a locked steel door giving access to the fuses only for the electrician or other authorized party. The push-button switches are mounted on either side of the cutout compartment, so they may be operated without opening the latter. When installed in public corridors or similar places, switches of the locking type can be provided in place of push-button switches of the more usual types.

These steel cabinets also possess the advantages inherent in rugged construction. They are compact and present a neat appearance. They are made for two-wire or three-wire circuits and can be obtained with or without the switch and cutout equipment. Sufficient knockouts are provided to permit their use for either conduit or open-wire construction. These switch cabinets are manufactured by the Columbia Metal Box Company, 226 East 144th Street, New York City.

## Illumination Tests of Brascolite Units.

In our issue of March 8, page 526, an illustrated description was given of the Brascolite luminous unit, which is a semi-indirect lighting fixture of neat design and rugged yet inexpensive construction, made by the St. Louis Brass Manufacturing Company, Jefferson and Washington Avenues, St. Louis, Mo. A number of illumination tests of this type of fixture were recently made by Prof. George W. Lamke, of the Department of Electrical Engineering, Washington University, St. Louis.

The first test was in a room with a 16-foot ceiling and decorated with medium tan calcimine. Four 250-watt Brascolite fixtures were suspended 10 feet from the floor and each was equipped with a clear Columbia Mazda lamp. The energy consumption was one watt per square foot of floor area and the average illumination on a plane 33 inches from the floor was 4.7 foot-candles.

In the second test a room 15 by 19 with a 13-foot ceiling and similarly decorated, was equipped with a 250-watt Brascolite fixture with clear Columbia Mazda lamp and suspended 10 feet 6 inches from the floor. This gave about one watt per square foot of floor area and the illumination on the test plane, 33 inches from the floor, averaged 4.7 foot-candles.

In the third test the same room was equipped with a direct-lighting fixture suspended the same distance from the floor with a 250-watt clear Columbia Mazda lamp and the illumination on the same test plane was found to be an average of 4.4 foot-candles.

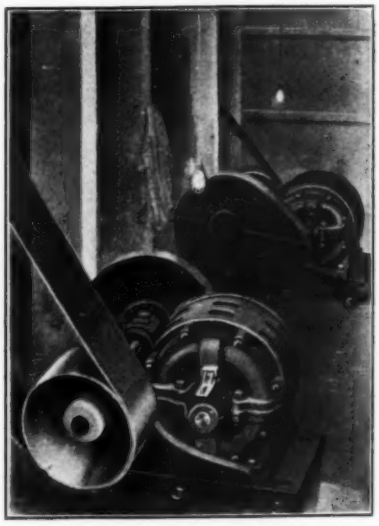
The fixtures in each case were suspended in a manner corresponding with general office conditions and it is noteworthy that the third test showed that the direct-lighting equipment was not as efficient as the semi-indirect equipment.

## Motor for Stamp-Mill Drive.

A special motor for driving stamp mills has recently been placed on the market by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., after thorough tests in actual service had proved its suitability for this work.

The motor is mounted in a cradle which in turn is mounted on a heavy base plate. The cradle carries a back shaft to which the motor is geared. The back-shaft pulley runs at slow speed so that it can be belted directly to the bull wheel of the stamp mill, thus eliminating the jack shaft and saving space, belting, the loss of power due to belt slippage, and the expense of maintenance of the jack shaft. The motor cradle can be slid along the base plate for belt adjustment, an especially long range of adjustment being provided.

The pulley is outside the bearing on the cradle, so that the belt can be easily removed. The motor gear and pinion can also be removed without disturbing the line-up of the pulleys



Motors for Stamp Mills.

or handling the belt. The back-shaft bearings are split and can be inspected or renewed after merely slackening the belt. The gears are inclosed in a dust-proof case, and they run immersed in oil.

The motor itself is extremely strong and rugged and is built to withstand the very severe service encountered in stamp-mill drive. It is of the type originally designed for steel-mill work, where the worst operating conditions found in any industry must be successfully withstood.

This outfit can be supplied for driving mills of from 3 to 20 stamps, with stamps weighing from 800 to 1,250 pounds. One motor is ordinarily used for each battery and is shut down when the battery is not in use, thus avoiding the waste of power of motors running without load.

# Current Electrical News

## LIGHTING AND POWER.

*(Special Correspondence.)*

RINGGOLD, GA.—The Ringgold Improvement Club is interested in electric lights for its city.

CONWAY, ARK.—Ten thousand dollars will be expended in improving the electric light plant.

HUMBLE, TEX.—The municipal water and light plant recently destroyed by fire will be rebuilt.

ASTORIA, ORE.—City officials are considering the advisability of installing a municipal lighting system.

DE RIDDER, LA.—E. J. Legarden has been granted a franchise to construct an electric-light plant.

KIMBALL, S. D.—The City Council has granted a franchise for the installation of a $10,000 electric light plant.

RULO, NEB.—Ten thousand dollars will be expended for electric lights. Address the city clerk for particulars.

WEST POINT, GA.—The Columbus Power Company will build a substation to develop about 8,500 horsepower.

ST. THOMAS, N. D.—Seven thousand dollars will be expended for an electric plant. Address the city clerk.

BLOOMFIELD, KY.—Harry M. Logan has been granted a franchise to furnish the town with street lighting.

PUYALLUP, WASH.—The city of Puyallup is in the market for power. Address Attorney M. F. Porter for particulars.

MEADE, KANS.—The Council will purchase the electric plant or erect a new one. The city clerk is in charge of the matter.

LAKELAND, FLA.—The city is planning to improve and extend its electric light plant. The mayor has charge of the matter.

RAYVILLE, LA.—The City Council is planning to install an electric light plant. Address C. A. Smith in regard thereto.

LEROY, N. Y.—The School Board is planning to install its own light and water system. Address the clerk of the Board for particulars.

PROVO, UTAH. — The Knight Woolen Mills will be electrified. General Manager Henry Stringham is in charge of this improvement.

OROVILLE, CAL.—Bids will be received up to June 2 for a franchise through Butte County, applied for by the Great Western Power Company.

CEDAR FALLS, IOWA.—City Engineer Streeter is preparing plans for the erection of a city lighting plant for the Citizens' Gas & Electric Company.

NEW YORK MILLS, MINN.—There is a movement on foot to have the village electric lighted, deriving the power from the plant at Fergus Falls.

YUBA CITY, CAL.—Bids will be received up to June 3 for the sale of a five-year franchise in Sutter County, applied for by the Great Western Power Company.

HUNTINGTON, IND.—The Huntington Light & Fuel Company has increased its capital stock from $250,000 to $750,000, and new machinery costing $50,000 will be installed.

NEW YORK, N. Y.—Old School Electric Power Company, Incorporated, has been incorporated with a capital stock of $3,000 by Milton S. Guiterman, Allen H. Remsen and Joseph F. Crater.

CHATHAM, MASS.—The selectmen of this place have been authorized to grant a franchise to the Buzzards Bay Electric Company. It is expected that a lighting plant will be in operation next fall.

SOUTHBRIDGE, MASS. — It is stated that the Webster & Southbridge Gas & Electric Company will make changes to the lighting in certain streets in this city that will aggregate a total cost of $15,550.

POUGHKEEPSIE, N. Y.—A plan for the establishment of a municipal lighting plant will come up before the common council. The size of the plant and its location will be discussed by a special committee to be appointed.

WHAT CHEER, IOWA.—The ownership of the What Cheer Light Company has been changed and it is proposed to erect a new building and purchase new machinery. Address T. W. Richardson in regard to the matter.

CINCINNATI, O.—The Union Gas & Electric Company plans to have a new generating station which will cost between three and four million dollars. It is estimated that it will take a year to place the plant in operating condition.

NORWICH, CONN.—The Rex Power Company has been incorporated with a capital stock of $50,000. Charles W. Comstock, of Montville, is interested in the company. The corporation is empowered to purchase other companies.

PRESTON, IOWA—A proposition which has been received with special favor, regarding the purchase of an electric lighting system for the city of Preston, was made by Manager Mowey of the Electric Light Company of Maquoketa.

TACOMA, WASH.—Davis & Hull, electrical engineers and contractors, this city, have completed the specifications for the installation of electrical machinery for four floors in the new furniture factory of F. S. Harmon & Company here. There will be 20 motors. O.

PORT ANGELES, WASH.—The Electric Light Committee of the City Council and the city engineer have been requested by the City Council to bring in a report showing the cost of machinery for a complete new lighting plant, as one may be constructed by the city. O.

WINONA, MINN.—Improved electric lighting will be authorized. A hustling committee from the Association of Commerce has the matter in hand and is now endeavoring to make sure of what would be the best system before going ahead. George Hirsch has charge of the matter.

FRESNO, CAL.—The Compressed Air & Machinery Company, of San Francisco, has submitted plans to County Purchasing Agent Uhler for an electric power and light plant to supply the various public institutions. Depending on the location, the proposed plant would cost $20,000 to $26,000.

OSWEGO, N. Y.—Extensive improvements for lighting the suburban districts in this section of the county are being planned by the Peoples' Gas & Electric Company. The company will soon begin the work of extending an electric line from Fruit Valley to Southwest Oswego, a distance of three miles west of this city.

LEBANON, PA.—The Lackawanna Iron & Steel Company, which owns the two blast furnaces at Colebrook, has given out notice that they will electrify the furnaces, ore, coke, coal and stone-handling equipment, and will erect new bins and conveyors. The coke ovens, several in number, will come for a share in the improved systems of operation. N.

PHILADELPHIA, PA. — Thomas Newhall, Ithan; Julius L. Adams, Norristown; and Gerald Helsman, Philadelphia, are the incorporators of six electric companies, each with a capital stock of $5,000, and named respectively Cooperstown Electric Light & Power Company; Gladwyne, Gulph, Interborough, Ithan and Millbourne Light & Power Companies.

HARRISBURG, PA.—Charters have been issued to Charles Cochran, Joseph Cochran, Jr., and Ernest H. Davis for the Armstrong Township, DuBoistown Borough, Loyalsock Township, Old Lycoming Township, Porter Township, Piatt Township, South Williamsport Borough and Woodward Township Electric Companies, each with a capital stock of $5,000.

MINNEAPOLIS, MINN. — The Northern Mississippi River Power Company has been organized as a subsidiary of the Northern States Power Company to construct and operate a hydroelectric plant at Coon Rapids on the Mississippi River, near this city. The operation of the property will be in charge of H. M. Byllesby & Company. Construction is under way and there will be an immediate installation of 10,500 horsepower.

BINGHAMTON, N. Y.—It is expected that the plans for the $60,000 appropriated last fall for equipping a

new electric power station will soon be carried out. These plans call for the installation of three entirely new direct-connected dynamos, two of 150-kilowatts capacity and a third of 75-kilowatts. The installation of this high-voltage equipment will mean the installation of a new and complete system of feed-wiring.

CHIPLEY, FLA.—On May 20 bids will be received for furnishing material, equipment, and machinery for the construction of an electric-light system for the Chipley Light & Power Company. The plant will consist of one four-valve high-speed automatic engine of 115 rated horsepower, direct connected to a three-phase 60-cycle 2,300-volt alternating-current generator. The engine will take steam from boilers already installed. There will also be furnished and erected switchboard and station instruments and approximately five and one-half miles of distribution system, on which will be placed 75 100-watt tungsten incandescent lamps. Address A. A. Myers, president, in regard to the matter.

## TELEPHONE AND TELEGRAPH.

*(Special Correspondence.)*

NAPLES, S. D.—Arrangements are being made to construct a telephone line from Naples to Vienna. C.

LORAIN, O.—The Black River Telephone Company will lay conduits in the alleys and streets south of Twenty-second Street.

UKIAN, CAL.—The Redwood Valley Rural Telephone Company has been granted a permit to operate a private rural-telephone line.

FALLON, NEV.—A franchise to operate a telephone and telegraph system in this city has been granted to a Municipal Corporation of the State.

DANCY, WIS.—Dancy Telephone Company has been incorporated with a capital stock of $2,000 by M. H. Allenburg, John Marchel and Gustav Borth.

CORNELL, WIS.—Cornell Telephone Company has been incorporated with a capital stock of $3,000 by G. F. Steele, Charles McArthur and P. J. Skolsky.

FREMONT, KANS.—The Fremont Mutual Telephone Company has been incorporated with a capital stock of $2,000 by J. F. Darrah, of Marquette, and others.

CANTON, KANS.—The Canton Telephone Company is planning to extend its line to Hesston so as to connect with the Bell system and give better toll service.

McCLUSKY, N. D.—Lincoln Valley Telephone Company has been incorporated with a capital stock of $6,000 by George Engel, Michael Schindler and John Werner.

BAY CITY, TEX.—It is announced that the Southwestern Telephone & Telegraph Company will expend $25,000 in this city in providing an exchange with modern equipment.

HARRISBURG, PA.—The Bell Telephone Company has made an appropriation of nearly $5,000 to build a new trunk circuit to Newville and another to Chambersburg from this city.

ALBANY, N. Y.—Southwestern Telephone Company, Incorporated, has been incorporated with a capital stock of $1,000 by Frank Shepard, Darius H. Rundell and Everett E. Palmer.

CLOUDCROFT, N. M.—At a recent meeting of the stockholders of the James Canon Telephone Company it was decided to go ahead with the construction of a line about 20 miles long.

VALLEJO, CAL.—The officials at the Mare Island Navy Yard have forwarded to the Department at Washington a recommendation for the increase of the telephone capacity at Mare Island.

LUNDS VALLEY, N. D.—The Farmers' Mutual Telephone Company has been incorporated with a capital stock of $25,000 by N. G. Evans, Andrew Roise and Lars Enerson, all of Lunds Valley.

ABINGDON, ILL.—The City Council has granted a 25-year franchise to the Home Telephone Company and the company is planning a new exchange building and the rebuilding of some of its lines. Z.

NASHVILLE, TENN.—The Unicoi Telephone Company will increase its capital stock to $10,000, and contemplates constructing a system from Erwin to Flag Pond and from Unicoi to Limestone Cove.

PASCO, WASH.—Work will commence soon on the installation of a modern telephone system here. Address R. A. Kline, president of the Twin City Telephone Company, for desired information.

WALLA WALLA, WASH.—The Pacific Telephone & Telegraph Company contemplates construction work in the inland division aggregating $11,620 the coming season, according to C. E. Hickman, Spokane.

NASHVILLE, TENN.—Leon Home Telephone Company has been incorporated with a capital stock of $1,500. The incorporators are J. H. Cummins, J. A. Hawkins, J. C. Chaffin, J. A. Anderson, Thomas Pippin and N. A. Montgomery.

FARRINGTON, N. D.—At the office of E. P. Kelly last Saturday a new rural telephone company was organized to be known as the Wyard Telephone Company. F. M. Truillinger is president of the company. The line will be 12 miles long. C.

NAPOLEON, O.—The City Council has granted a franchise to Charles W. Jackson for the purpose of installing a new telephone system here. It is stated that Mr. Jackson will assign the franchise to the Henry County Mutual Telephone Company.

NEWCASTLE, IND.—The question of installing the popular cluster electric lighting in the business district and where wanted in the residence district was one matter of great importance introduced at the City Council. Address the city clerk for further particulars.

POWERS LAKE, N. D.—The Farmers' Mutual Telephone Company has been incorporated with a capital stock of $25,000. The First Board of Directors is composed of John O. Grubb and Julius Johnson, of Battleview, and M. N. Ledene, Lauitz Nelson and Martin Sellie, of Powers Lake. It is planned to build lines from Powers Lake to White Earth, to Battleview, to Stanley and to Bowbells.

## ELECTRIC RAILWAYS.

*(Special Correspondence.)*

JACKSONVILLE, FLA.—The Jacksonville Traction Company will build a line on Pearl Street.

LINDEN, MICH.—The Village Council has granted a franchise to the Independent Light & Power Company for an electric railroad.

JACKSON, GA.—The Middle Georgia Interurban Company is planning to establish an electric-railway system here. L. W. Roberts is president of the company.

PRESQUE ISLE, ME.—The Aroostock Valley Railroad Company is preparing plans for the construction of an electric railway from Carson to Caribou. A. R. Gould is president of the company.

TOTTENVILLE, N. Y.—The Staten Island Rapid Transit Company is planning to double-track its system from Prince Bay to Pleasant Pains and to install an electric automatic-signal system through this section of the line.

COFFEYVILLE, KANS.—Bonds to the amount of $30,000 to aid in building a $500,000 electric line to Nowata, Okla., were voted by an overwhelming majority. The city clerk may be addressed in regard thereto.

ST. JOSEPH, MO.—It is proposed to persuade the Doherty Operating Company to finance an electric line, for both passenger and freight traffic, through a particularly rich and populous part of Andrew and Gentry Counties.

WENDELL, IDAHO.—With an electric line practically assured from Wendell to Hagerman, negotiations are now under way for a continuation of this line to Buhl on the south side of the river. Address J. S. Clark in regard to the matter.

WOODLAND, CAL.—Brainard Brothers, fiscal agents for the Sacramento Valley Electric Railway Company, have announced that $410,000 worth of stock has been sold and that it is planned to let the first contract for grading the road in May.

CATAWISSA, PA.—It is stated that certain capitalists are interested in taking over a charter which was issued a few years ago to build an electric railway between this city and Numidian and completing the line, some construction work on which was done in 1910 and 1911.

COLUMBUS, O.—The Middleport & Northwestern Railway Company has been incorporated by D. N. Postlewaite, Charles P. Outhwaite, Singleton P. Outhwaite, N. Bragunier and J. C. Nickert. It is planned to build and operate an electric line through Meigs, Athens and Washington Counties to Marietta.

BUFFALO, N. Y.—James S. Simmons, it is said, has promised that the Frontier Railway Company will begin the construction of its proposed line between Niagara Falls and Buffalo within three months or else abandon the project altogether. Mr. Simmons is of the opinion that the line will be completed and in operation by the specified time, July 1, 1914.

EUREKA, CAL.—An electric railroad from Kerbel to the Eel River Valley section is the proposition being investigated by Richard H. Tingley,

electrical engineer, who is there in response to the invitation of the Humbold Promotion and Development Committee. Mr. Tingley represents capitalists who are developing electric railroads in several parts of the United States.

LEWISTON, IDAHO. — Detailed specifications for cars, rails, substation equipment, etc., of the proposed Lewiston-Clarkston Valley Railway Company's line have been completed, and work on the construction is to be started at once. It is expected the line will be built as far as Clarkston, Wash., by August 1. Contract will then be let for the continuation of the line to Asotin, Wash. O.

SAGINAW, MICH.—At the meeting of the Special Board of Trade Street Car Extension Committee announcement was made that a satisfactory agreement had been reached whereby the Saginaw Valley Traction Company expresses its willingness to construct between 11 and 12 miles of extensions, provide for necessary future extensions, and to accept a 30-year franchise. Address L. A. Cleveland, manager, for further particulars.

## NEW INCORPORATIONS.

CONOVER, N. C.—The Conover Electric Company has been chartered with a capital stock of $25,000 by C. S. Coyney, A. L. Shuford and others.

SEATTLE, WASH.—Long Distance Telephone Equipment Company has been incorporated with a capital stock of $300,000 by Oscar O. Mercer, J. Linn Criswell, and others.

JOPLIN, MO.—The Arnold Motor & Supply Company has been incorporated with a capital stock of $2,000. The incorporators are Jesse L. Arnold, Ida Tweed Arnold and Flora Arnold Snider. Z.

CHICAGO, ILL.—The Alter Light Company has been incorporated with a capital stock of $50,000 to manufacture lighting appliances. The incorporators are Henry S. Blum, Isadore Wolfsohn and Albert M. Blum. Z.

ROANN, MO.—Roann Water & Light Company has been incorporated with a capital stock of $15,000 to operate a water and lighting business. The directors are B. E. Geltry, C. M. Comer and J. M. Wagoner.

CHICAGO, ILL.—Ohio Distributing Company has been incorporated with a capital stock of $12,000 to deal in electrical supplies. The incorporators are H. J. Russell, Vincent C. Mooney, Henry P. Simonton.

HAMMOND, IND.—Tri-City Electric Service Company has been incorporated with a capital stock of $10,000 to engage in general electrical work. The incorporators are F. D. Jarvis, L. J. Granger and A. H. Lietz.

FORT WAYNE, IND.—Wabash Valley Utilities Company has been incorporated with a capital stock of $10,000 for the purpose of furnishing heat, F. H. Schmidt and O. H. Lindenberg are the incorporators.

NEW YORK, N. Y.—Savage Novelty Company, Incorporated, has been incorporated with a capital stock of $10,000 for the purpose of manufacturing electrical novelties. The incorporators are Robert M. Simpson, John H. Hawley and Gustav A. Handte, all of New York City.

## FOREIGN TRADE OPPORTUNITIES.

*(Parties interested in the following items should address the Bureau of Foreign and Domestic Commerce, Washington, D. C., and refer to the file number noted.)*

NO. 10,805. TELEPHONE SYSTEM.—A report from an American consular officer in a South American country states that a telephone company in his district has decided to replace its present Bell system by an up-to-date automatic system. The company has 2,000 subscribers and is still increasing the number.

NO. 10,808. SWITCHGEAR.—The Chairman, Electric Supply Committee, Town Hall, Melbourne, Australia, will receive bids until May 30 for supplying high-tension switch gear with remote control for the City Council. Tender form, specification, etc., can be obtained on application to McIlraith, McEacharn & Company, Limited, Billiton Square Buildings, London, E. C., England.

NO. 10,810. TRAMWAY CONSTRUCTON.—The Public Works Department, Madrid, Spain, invites tenders until May 8 for the construction of three lines of electric tramways at Cadiz. Tenders will be received until May 19 for the construction and exploitation of electric tramway at Barcelona. Particulars may be obtained of the Ministerio de Fomento, Madrid, and tenders will be received through local agents only.

NO. 10,811. TELEPHONE AND TELEGRAPH MATERIAL.—The Postmaster General, Hobart, Tasmania, will receive tenders until June 9 for furnishing the following materials: Insulators, telephone distribution switchboards, telephone wire (iron, steel, copper, and bronze), insulated wire, telephone instruments and accessories, battery material, and lead-armored telephone cables.

## PROPOSALS.

GENERATORS.—Bids will be received until May 15 by M. Peterson, secretary, Winnipeg, Manitoba, for large generators for turbines.

ILLUMINATING PLANT. — Bids will be received until September 10 by Comision de Puertos, Santiago, Chile, for an illuminating plant for the port works.

CONDUIT.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Washington, D. C., until May 20 for furnishing 5,000 feet of three-quarter-inch galvanized-steel conduit, to be delivered at the Navy Yard, Brooklyn, N. Y., as per Schedule 5401.

AUTOMOBILE AMBULANCE.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until May 20 for one automobile ambulance, to be delivered at the Navy Yard, Washington, D. C., as per Schedule 5,395.

WIRING AND LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until May 14 for a conduit and wiring system, lighting fixtures, etc., in the post office at Providence, R. I. Copies of drawings and specifications may be obtained at the discretion of the Supervising Architect.

CEDAR POLES.—Bids will be received by W. F. Lentz, secretary of Public Utility Board, Rochester, Minn., for furnishing one carload of good cedar poles for the use of the city electric-light plant. The poles are to be 35 feet long, seven-inch top, and bids are to be on the basis of price per pole f. o. b. Rochester. Check for ten per cent is required.

ENGINES AND GENERATORS.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until May 14 for furnishing two new engines and generators in the post office at Philadelphia, Pa., in accordance with drawing and specification, which may be obtained from the Supervising Architect.

POWER HOUSE.—Sealed proposals will be received until May 19 by the Board of County Commissioners, of Lucas County, O., at the office of the County Auditor, Toledo, O., for the performance of all labor and the furnishing of all materials required in the construction of a power house for the Lucas County Infirmary. Plans and specifications may be seen at the office of the County Auditor and also at the Valentine Building, Toledo, at the office of David L. Stine, architect.

POWER HOUSE AND EQUIPMENT.—Sealed proposals will be received at the United States Engineer Office, Pittsburgh, Pa., until May 21 for building a fireproof power house, furnishing and installing one 115-horsepower boiler, one 15-horsepower boiler, one steam-driven air-compressor and two air receivers, piping, and accessories, and furnishing one feed-water heater, one feed-water pump, and one service-water pump at each of dams Nos. 7 and 9, Ohio River. Information on application to Francis R. Shunk, engineer.

ELECTRIC WIRING AND INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until May 13 for the conduit and wiring and lighting fixtures of the post office at Marquette, Mich., and until June 2 for the electric conduit and wiring and interior lighting fixtures of a two-story-and basement extension of the post office at Winston-Salem, N. C., in accordance with drawings and specifications, copies of which may be obtained from the custodian of the site or the Supervising Architect.

ELECTRICAL SUPPLIES.—Sealed proposals will be received at the office of the Constructing Quartermaster, U. S. Military Prison, Fort Leavenworth, Kans., until May 8, for furnishing electrical supplies, including 1,420 outlet boxes, 310 electric-light brackets, 2,730 bushings, 70 conduit clamps, 310 insulating joints, 21,810 feet electric conduit, 25 electric condulets, 1,860 outlet-box covers, 3,000 conduit lock nuts, 1,325 receptacles, 500 bases, 1,900 standard stools, 384 holaphane shades, 295 fixture studs, 40 pounds solder, 48 pounds tape 22,100 feet stranded conductor, 300 feet lamp cord, 2,000 feet rubber-covered fixture wire, 6 panel boards, 6 panel-board cabinets, 2 switchboard panels, 12 units, 24 terminals, 1 slate, 1,200 gross screw anchors, 1 rubber matting, etc. For further information address Thomas H. Slavens, lt. col., Q. M. corps, constructing Q. M.

## FINANCIAL NOTES.

The Highland Power Company has been organized with a capital of $400,000 six-per-cent preferred and $1,000,000 common stock to develop hydroelectric power near Boulder, Col. The company owns a power site about eighteen miles from Boulder.

The Interstate Electric Corporation has authorized an issue of $2,000,000 first-lien six-per-cent sinking-fund gold bonds due March 1, 1933, for the purpose of acquiring public-utility properties consisting of gas, electric light and city water works in the states of Pennsylvania, Iowa, Missouri and Texas.

The Montana Power Company has come into possession of the entire capital stock of the Thompson Falls Power Company, the Great Falls Waterpower & Townsite Company, and all right, title and interest in the Missoula River power sites, paying out $5,000,000 par of its own preferred stock and $22,500,000 par of its common stock. When the Montana company was formed last December, it took over one-half of the Great Falls company's stock. During the past few weeks it has taken over the balance. Consideration for this one-half and the entire capital stock of the Thompson Falls Power Company was 50,000 shares of Montana Power preferred and 225,000 shares of the common.

Stockholders of the Consolidated Gas, Electric Light & Power Company, of Baltimore, authorized the issuance of $6,000,000 of debentures, bearing not more than five-per-cent interest, and also an issue of common stock to the amount of $3,000,000. Of the debentures authorized $3,500,000 have been underwritten by English and American bankers, $2,000,000 being taken abroad, and $1,500,000 in this country. The debentures were sold by the company to the underwriters on a 5.41-per-cent basis, and it will be placed with investors on a 5.21-per-cent basis. The debenture stock is convertible into common stock on the basis of £25 sterling for the debentures, and $100 par value of the stock. The company reserves the right to retire the debenture stock at any time at 110, at ninety days' notice.

Samuel T. Murdock, general manager of the Indiana Lighting Company and purchaser of the stock of the Merchants Lighting Association of Lafayette, Ind., announces that the new general service company incorporated at Indianapolis is a consolidation of the Merchants Electric Lighting Association of Lafayette, the Crawfordsville Light & Water Company, and some smaller properties of the same kind. The capital stock of the consolidated company is $900,000. Eventually this property will pass into the possession of the Indiana Lighting Company. The incorporation of the new company is simply a step in the direction of the transfer of property to the Indiana Lighting Company.

A committee of the minority stockholders of the Northern Colorado Power Company and A. M. Chambers, vice-president of the Electric Properties Company will agree upon a reorganization of the company which will obviate a receivership and at the same time provide funds for the extension and improvement of the properties of the corporation. The committee has been authorized to make the best terms possible with Hallgarten & Company, who own a large amount of $853,000 notes of the company, which mature May 1. It is proposed to scale the first mortgage bonds, amounting to $3,500,000, down 25 per cent and also to cut the common and preferred stock proportionately. Plans now under consideration provide for the payment of the notes of the company and the raising of $300,000 in cash for extension of lines to supply power to a large territory for irrigation purposes and other needs of farming communities.

Interests controlling the Bucks County Electric Railway and the New Jersey & Pennsylvania Traction Company will make application to the Governor on May 5 for charters for 20 lighting companies. Under the charters the companies would operate in the sections of Bucks County traversed by the Philadelphia and Eastern Railway, extending from Doylestown to Easton, and the Bucks County and the New Jersey and Pennsylvania lines. Practically all the more important boroughs in Bucks County are within the territory covered by the charters. The incorporators in each case are W. Frederick Snyder, John Barbey, Frank Battles, Sydney L. Wright, William Redwood Wright and Walter J. Bilyeu. The proposed new companies are: Borough of Bristol Light Company, South Langhorne Light Company, Langhorne Manor Light Company, Langhorne Light Company, Lower Makefield Light Company, Wrightstown Light Company, Morrisville Light Company, Buckingham Light Company, Falls Light Company, Newtown Light Company, Upper Makefield Light Company, Doylestown Light Company, Yardley Light Company, Middletown Light Company, Bristol Township Light Company, Solebury Light Company, Borough of Doylestown Light Company, New Hope Light Company, Hulmeville Light Company, Taylorville Light Company.

### Dividends.

American Utilities Company; regular quarterly dividend of 1.5 per cent on its preferred stock, payable May 10 to stock of record April 30.

Cape Breton Electric Company; a semi-annual dividend of $3 a share on preferred stock, and a dividend of $3 a share on common stock, both payable May 1 to stock of record April 25. This is an increase of $1 on the common stock, last previous dividend having been $2 a share.

Lincoln Traction Company; a quarterly preferred dividend of 1.5 per cent, payable May 1 to stock of record April 19.

Montreal Light, Heat and Power Company; a regular quarterly dividend of 2.25 per cent, payable May 15 to stock of record April 30.

Southern California Edison Company; a regular quarterly dividend of $1.25 a share on its common stock, payable May 15 to stock of record April 30.

Tampa Electric Company; a quarterly dividend of $2.50 a share on its capital stock, payable May 15 to stock of record May 3.

### Reports of Earnings.

BUFFFALO GENERAL ELECTRIC YEAR.

The report of the Buffalo General Electric Company for the year ended December 31, 1912, shows net earnings of $526,355, against $459,743 in 1911. The balance available for dividends was $416,007, equal to 11.17 per cent on the capital stock, as compared with 9.66 per cent earned the previous year. The income account compares as follows:

| | 1912. | 1911. |
|---|---|---|
| Gross operating revenue. | $1,349,115 | $1,213,139 |
| Operat. exp. and taxes | 822,760 | 753,396 |
| Income from operating | $526,355 | $459,743 |
| Non-operating income .. | 51,203 | 52,680 |
| Gross income ..... | $577,558 | $512,423 |
| Interest ..... | 161,550 | 152,458 |
| Net income ..... | $416,007 | $359,965 |
| Dividends ..... | 223,440 | 223,440 |
| Surplus ..... | $192,567 | $136,525 |

WESTERN UNION.

The Western Union Telegraph Company has issued its estimated statement of earnings for the quarter ended March 31, 1913, which compare with the same period of previous year, as follows:

| | 1913. | 1912. |
|---|---|---|
| Gross income ..... | $11,054,000 | ..... |
| *Expenses ..... | 9,944,140 | ..... |
| Net revenue ..... | 1,109,860 | $1,220,000 |
| Bond interest ..... | 334,310 | 434,250 |
| Balance ..... | 775,550 | 785,750 |
| Dividends ..... | 748,050 | 747,970 |
| Surplus ..... | 27,500 | 37,780 |

*Includes rent of leased lines, current maintenance, depreciation and taxes.

CHICAGO RAILWAYS COMPANY.

The Chicago Railways Company has issued its annual report for the year ended January 31, 1912. The non-partnership account for the year ended January 31, 1913, compares as follows:

| | 1913. | 1912. |
|---|---|---|
| *Gross income ..... | $5,149,139 | $4,429,648 |
| Interest ..... | 4,140,569 | 3,958,878 |
| Miscellaneous ..... | ..... | 1,144 |
| Sinking fund ..... | 250,000 | 250,000 |
| Corp. exp. & adjustment | 120,574 | 118,401 |
| Total deductions ..... | 4,674,063 | 4,328,424 |
| Net income ..... | 475,076 | 101,224 |

*Consists of 5 per cent interest allowed on investment, Chicago Railways' share of net income (45 per cent), and miscellaneous interest.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES OF THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

| | Apr. 28. | Apr. 21. |
|---|---|---|
| American Tel. & Tel. (New York) | 129¼ | 129½ |
| Commonwealth Edison (Chicago) | 130 | 135¾ |
| Edison Electric Illuminating (Boston) | 274 | 277 |
| Electric Storage Battery common (Philadelphia) | 48½ | 50½ |
| Electric Storage Battery preferred (Philadelphia) | 48½ | 50½ |
| General Electric (New York) | 138 | 139½ |
| Kings County Electric (New York) | 129 | 129 |
| Manhattan Transit (New York) | 1½ | 1¾ |
| Massachusetts Electric common (Boston) | *18½ | 18½ |
| Massachusetts Electric preferred (Boston) | 75½ | 77¼ |
| National Carbon common (Chicago) | 116 | 116½ |
| National Carbon preferred (Chicago) | 115 | 116 |
| New England Telephone (Boston) | 142 | 149 |
| Philadelphia Electric (Philadelphia) | 22¼ | 22¾ |
| Postal Telegraph and Cables common (New York) | 82 | 83 |
| Postal Telegraph and Cables preferred (New York) | 67 | 67 |
| Western Union (New York) | 65½ | 66¼ |
| Westinghouse common (New York) | 62¼ | 63⅞ |
| Westinghouse preferred (New York) | 115 | 118½ |

*Last price quoted.

## NEW PUBLICATIONS.

BUSINESS OPPORTUNITIES.—The Chicago, Milwaukee & St. Paul Railway Company has issued through its passenger traffic department a booklet entitled "New Towns and Business Opportunities." A list of towns along the line of this railroad is given together with the lines of business in which there are openings for new concerns. These include a number which lack electric light and power plants, as follows: Charter Oak and Melbourne, in Iowa; Laredo, Mo.; Baker and St. Regis, Mont.; Gascoyne, New England and Scranton, in North Dakota; Isabel, McIntosh, Presho and Stickney, in South Dakota.

SAN FRANCISCO RAILWAYS.—The full report on the improvement and development of the transportation facilities of San Francisco, Cal., submitted by Bion J. Arnold to the Mayor and Board of Supervisors has been printed and bound. It includes a study of the present transportation conditions and a consideration of improvements in the city plan and changes in service and routing to properly meet the requirements of the city. The financial situation and also the question of franchises and legal matters is fully discussed. The report contains a good index, is supplied with a large amount of tabular information and is profusely illustrated with diagrams and maps. Copies bound in cloth will be supplied for $1.00 each.

## PERSONAL MENTION.

EDWARD L. NICHOLS, of the Department of Physics of Cornell University, Ithaca, N. Y., has been appointed dean of the College of Arts and Sciences.

FRANK E. WATTS, Jupiter of the Jovian Order and formerly manager of the Sunbeam lamp department of the Western Electric Company, has joined the advertising staff of the *Electrical World*.

C. A. JOHNSON, professor in the School of Engineering of the University of Kansas, left Lawrence on May 1 for Panama, to lay out the electrical power and control circuits for operating the canal systems.

LOUIS DUNCAN, consulting engineer, has removed his offices from 55 Liberty Street to 50 Church Street, New York, and has associated himself with S. Marsh Young and Henry A. Pressey, under the firm name of Duncan, Young & Pressey, Incorporated.

HAROLD T. BARNES, of McGill University, Montreal, will use his microthermometer to detect the presence of ice on the Government expedition on the steamer *Montcalme*, which will patrol the entrance of the Gulf of St. Lawrence to report the presence of icebergs.

ARTHUR WILLIAMS, of the New York Edison Company, was tendered a testimonial banquet because of his decoration with the Cross of the Order of Isabela de Catolica by His Excellency Juan Riano y Gayangos, envoy extraordinary and minister plenipotentiary of Spain to the United States of America, on the evening of May 2, at Sherry's, New York.

FRANK A. DRISCOLL, the well known Pass & Seymour representative, who has made a host of friends in Chicago and contiguous territory, has been transferred from the Chicago office of the company to New York State territory. Mr. Driscoll's home is in New York State. Chicago Jovians are mourning the loss of a crackerjack Pluto from its first-degree degree team.

L. A. BAUER, director of the Department of Terrestrial Magnetism of the Carnegie Institution, will be abroad about two months arranging for co-operative magnetic work between the Department of Terrestrial Magnetism, Washington, D. C., and various foreign institutions. Dr. Bauer will deliver the Halley lecture on "Terrestrial Magnetism" at the University of Oxford on May 22.

ARTHUR J. SWEET has tendered his resignation as commercial engineer of the Holophane Works of General Electric Company to become a member of the firm of Vaughn & Meyer, consulting engineers, at Milwaukee, Wis. Mr. Sweet has been prominently identified during the past five years with research and commercial-development work in the field of illuminating engineering. During the past two years he has given his especial attention to the subject of railway lighting in its many phases, and last summer served as consulting engineer in direct charge of the extensive research work on postal-car lighting which was conducted at Washington, D. C., under the auspices of the Baltimore & Ohio Railroad. The association of Mr. Sweet in the firm of Vaughn & Meyer has come primarily as a result of the firm's growing practice in the fields of efficiency engineering and industrial appraisal work, as additional to its well established practice in steam and electrical engineering. Mr. Sweet will give his chief attention to handling the firm's extensive illuminating-engineering practice and of directing details of the office work, thus relieving the other members of the firm for their more extensive practice in the fields above mentioned. Mr. Sweet's energy and conscientious work have won him many friends, whose good will and support will follow him in his new work.

Arthur J. Sweet.

ROBERT A. MILLIKAN, professor of physics at the University of Chicago, has been awarded the Comstock prize of $1,500 for researches on the charge of the electron, the ratio of electric charge to mass, and gaseous ionization, by the National Academy of Sciences, Washington, D. C. The presentation was made by President Wilson at a reception to the members of the Academy at the White House on April 23. Professor Millikan was the only American among the four scientists honored by the medals awarded by the National Academy.

JOHN HAYS SMITH, commercial engineer of The Milwaukee Electric Railway & Light Company, in charge of engineering and sales of electric power and steam heat, has resigned to engage in consulting engineering, with offices in the Merrill Building, Milwaukee, Wis. Before going to Milwaukee, Mr. Smith was with the Duquesne Light Company of Pittsburgh. He was identified with the Westinghouse Electric & Manufacturing Company for seven years.

W. S. MURRAY has resigned as chief electrical engineer of the New York, New Haven & Hartford Railroad Company to form a partnership with E. H. McHENRY, vice-president of the New York, New Haven & Hartford, which will take over the large engineering work of the system as an independent contracting firm. This firm is also to take over the electrical engineering force of the road and will continue the electrification of the main line between New Haven and Stamford and complete this work. Besides this, the firm will probably have charge of the double-tracking, bridge and tunnel at Fall River, Mass., the tunnel and bridge at New London, Conn., the improvements at Springfield, Mass., and the terminal changes at Boston.

ROBERT W. PERKINS, who has been treasurer and general manager of the Norwich & Westerly Traction Company, has been elected president of the Shore Line Electric Railway Company. This line is owned by the Morton F. Plant interests of Norwich, Conn., where headquarters will be established. The Norwich & Westerly system came into the control of Morton F. Plant, after the latter system went through reorganization, upon its purchase in July, 1911, by the bondholders' committee. Under the management of Mr. Perkins the Norwich & Westerly was merged with the Pawcatuck Valley Street Railway Company, operating in Rhode Island and vicinity, and the Groton & Stonington Street Railway Company, operating between Groton and Westerly along the shore of Long Island Sound. The new trolley combination comes into existence with the leasing of the New York, New Haven & Hartford's Eastern Connecticut trolley lines to Mr. Plant, and includes everything in Eastern Connecticut and Southwestern Rhode Island.

BERNARD C. GROH, until recently chief engineer of the Illinois Telephone & Telegraph Company, Chicago, Ill., has been appointed plant-construction engineer for the Automatic Electric Company. Mr. Groh entered telephone work about 15 years ago, being associated with the American Telephone & Telegraph Company and some of its subsidiaries for about 11 years. In the last few years he has been conspicuous in the rebuilding of the automatic telephone system in Chicago. His work with the Automatic Electric Company will be at the head of a new department devoted to giving expert advice on the design and installation of automatic-telephone exchanges.

LEO H. BAEKELAND, of Yonkers, N. Y., the well known chemist and inventor of "Bakelite," is to be the re-

cipient of the Willard Gibbs medal, founded by William A. Converse. The first award was made in 1911, to Professor Arrhenius, director of the Nobel Institute at Stockholm, Sweden. The second medallist was Theodore W. Richards, professor in Harvard University. The formal presentation will be made to Dr. Baekeland at the May meeting of the American Chemical Society, under whose auspices the medallist is elected.

### OBITUARY.

HORATIO A. FOSTER, one of the best known electrical engineers in the country, was taken suddenly ill in the subway station of the Grand Central Depot, New York City, on the afternoon of April 27, and died before medical assistance could be summoned. The coroner's physician gave the cause of death as heart failure. Mr. Foster had been to the Engineers' Club and was on his way to his home in Yonkers, N. Y., when he was stricken. Mr. Foster began his career in the electrical industry with the Daft Electrical Company in the fall of 1884. In April, 1885, he went to Baltimore to electrify a short branch of the Baltimore Union Passenger Railway, which road was started in August of that year. He later became connected with the Thomson-Houston Electric Company at Lynn, Mass. In the fall of 1888 he was appointed superintendent of the East River Electric Light Company of New York City, remaining with that company and its successors until July, 1891. At that time he was appointed expert for the United States Census Office for checking the electrical enumeration for New York State. In May, 1893, he became connected with a technical journal known as *Electrical Industries*, becoming its editor. Late in that year he became associated with George Forbes, then the electrician of the Niagara Falls Power Company, and he was with the latter for about 18 months, having charge of the New York office. Early in 1895 he became associated with the Cataract Construction Company of Niagara Falls as testing engineer. He spent about a year and a half in this connection, and then for several years was in general practice as a consulting engineer. In 1906 he joined the forces of L. B. Stillwell, having direct charge of the reconstruction work at Baltimore where he was in charge of the rebuilding of power stations and substations, and the design and construction of the new power stations and substations. In 1898 Mr. Foster became associated with B. J. Arnold in Chicago, in his valuation work, during which time he made appraisals of the property of the Metropolitan Traction Company of New York City, the Detroit United Railway Company and the Southern California Edison Company at Los Angeles. Since that time he has been working on valuation of public utilities and in the study of traffic conditions for engineering reports of various sorts. Mr. Foster was also well known as the editor and compiler of Foster's "Electrical Engineer's Pocket Book."

Horatio A. Foster.

### DATES AHEAD.

Arkansas Association of Public Utility Operators. Annual convention, Fayetteville, Ark., May 5-7.

Oklahoma Electric Light, Railway and Gas Association. Annual convention, Oklahoma City, May 6-8.

Order of Railroad Telegraphers. Baltimore, Md., May 13.

National Fire Protection Association. Annual meeting, New York, N. Y., May 13-15.

American Institute of Electrical Engineers. Annual meeting. New York, N. Y., May 20.

Association of Railway Telegraph Superintendents. Annual meeting, St. Louis, Mo., May 20.

New England Electric Vehicle Association and the Electric Motor Car Club of Boston. Joint meeting, Boston, Mass., May 20-21.

American Society of Mechanical Engineers. Spring meeting. Hotel Belvedere, Baltimore, Md., May 20-23.

Southwestern Electrical and Gas Association. Annual convention, Galveston, Tex., May 21-24.

Electrical Supply Jobbers' Association. Spring meeting. Congress Hotel, Chicago, Ill., May 26-28.

National District Heating Association. Fifth annual convention, Indianapolis, Ind., May 27-29.

National Electric Light Association Annual convention, Medinah Temple, Chicago, Ill., June 2-5.

Canadian Electrical Association. Annual convention, Fort William, June 23-25.

Electrical Contractors' Association of the State of Missouri. Annual meeting, St. Louis, Mo., July 12.

National Electrical Contractors' Association. Annual meeting, Chattanooga, Tenn., July 16.

Michigan Section, National Electric Light Association. Annual convention, Ottawa Beach Hotel, Ottawa Beach, Mich., August 18-21.

## With the Electrical Manufacturers

**The Mechanical Appliance Company,** Milwaukee, Wis., has issued a folder calling attention to the Watson motor and the many advantages attendant on "Watsonizing" in any industrial plant.

**Pass & Seymour, Incorporated,** Solvay, N. Y., has published an Export Catalog No. 21, illustrating and describing the P. & S. specialties. This catalog is printed in Spanish, Portuguese and English, and makes a valuable addition to the literature on wiring devices.

**Delta-Star Electric Company,** Chicago, Ill., is distributing a data sheet showing the cost per kilowatt of substation equipment for commercial voltages from 13,200 to 33,000 volts. This data sheet will be of service to managers and engineers when called upon to make quick estimates of costs.

**Joseph Dixon Crucible Company,** Jersey City, N. J., has issued a booklet dealing with the use of graphite for boilers. It explains the action of fine-flake graphite in reducing the difficulties attendant upon the formation of boiler scale. It also describes the method of feeding the graphite, the quantity to be used and the results obtained.

**H. M. Byllesby & Company,** Chicago, Ill., has issued department bulletin No. 3. This is in the form of an attractive folder and is devoted to the work of the department of examinations and reports. It calls attention to the value of inventories and carefully prepared appraisals, and the many services that these are found necessary for by utility corporations.

**The Linemen Protector Company,** Detroit, Mich., has ready for distribution information in bulletin form regarding the Marshall linemen's shields for the protection of construction men against possible contact with dangerous circuits. Central-station managers and construction men should become familiar with the features of these shields. Full information will be furnished to those interested upon request.

**The General Electric Company,** Schenectady, N. Y., has prepared through its advertising department a fan-motor number of "The Electrical Advertiser." This shows electrotyped newspaper advertisements, illustrations and other material for exploiting current-consuming devices. The company is inaugurating an extensive campaign in the popular magazines which will

have a far-reaching effect upon the ultimate consumer.

**Safety Insulated Wire & Cable Company,** 114 Liberty Street, New York, has issued its new price list No. 101 on Safety Ruby-Core New-Code rubber-covered wire. The pamphlet, of convenient pocket size, gives lists on all copper-wire bases from 14 to 23 cents inclusive. A section is devoted to freight additions, whereby a customer in any section of the country can quickly determine the price on Safety Ruby Core, laid down in his own city or town.

**Osland Porcelain Company,** 123 Liberty Street, New York City, has been organized recently and is prepared to supply the electrical trade with a full line of standard electrical porcelains at prevailing market prices. This company is developing a general line of porcelain supplies, which it will shortly offer to the trade. The company has excellent facilities for manufacturing all kinds of porcelain specialties. Inquiries are requested from any one interested in this material.

**Paragon Sellers Company,** Chicago, Ill., has transferred its stock of specialties at San Francisco to 440 Market Street in charge of Paine, Bailey & Company and its Los Angeles stock to 443 East Third Street in care of F. F. Foster & Company. Each of these representatives will maintain full and complete stocks of the Paragon specialties, such as Paragon Ground Cones, Ironite wires, Self-Tying knobs, Handy lamp brackets and Paragon battery boxes. This plan will provide better facilities for the quick handling of orders.

**Line Material Company,** South Milwaukee, Wis., has published catalog No. 11. This is a 68-page publication dealing with the great variety of the Kyle line of line materials. Included in the specialties and supplies manufactured and listed in the catalog are steel arc-lamp hangers, self-locking windlasses, tungsten fixtures, brackets, ornamental lighting posts, street hoods, mast arms, malleable-iron pins and other line hardware and supplies. The bulletin is thoroughly illustrated and gives full data and prices of the apparatus described.

**Sprague Electric Works** of the General Electric Company, New York, has issued conduit catalog No. 439. Special care has been taken with regard to illustrating the various articles described. The catalog is very complete, including a complete representation of galvanized unlined rigid conduit, boxes and covers, gang floor boxes, standard flexible steel conduit, flexible steel-armored conductors and armored cord. The electrical contractor and jobber will find this catalog of great value as a ready reference and handy book to have around.

**Schwarze Electric Company,** Adrian, Mich., has issued a new catalog of the large variety of electric bells, buzzers and reeds that it manufactures. These are all of the loud-ringing type and are serviceable for battery current or direct or alternating line currents of any voltage. They are used for telephone extensions, signal or alarm purposes and in all positions where a powerful loud-sounding bell is needed. The electric reeds are particularly adapted for automobiles, motor trucks, motor boats and similar purposes. The construction and advantages of each type of bell are pointed out, and all necessary data connected therewith given.

**Westinghouse Electric & Manufacturing Company,** East Pittsburgh, Pa., has entered into contract with the Havana Electric Railway, Light & Power Company for the complete electrical equipment of a large power house which that company is now building in Havana, Cuba. This contract calls for three 12,500-kilovolt-ampere, 60-cycle, three-phase, 2,300-volt, Westinghouse-Parsons turbo-alternators; four 100-kilowatt exciters; nine 2,000-kilovolt-ampere, single-phase, oil-insulated, water-cooled, 13,200-volt transformers; twenty 100-light regulators; 2,000 of the new long-burning, carbon flame-arc lamps; 24 Roney automatic stokers; complete condenser equipment for the above-mentioned turbines, and one complete switchboard for the control of same.

# Record of Electrical Patents.

## Issued by the United States Patent Office, April 22, 1913.

**1,059,342. Process for Reducing Zinc Oxides.** C. F. Burgess, Madison, Wis. The oxide and carbon are electrically heated in separate chambers and the vapors of the oxide are then passed over the hot carbon.

**1,059,348. Resetting Device for Heat Coils.** F. R. Chapin, assignor to Western Electric Co., Chicago, Ill. A tool for supplying heating current to the resoldered parts.

**1,059,351. Armature.** O. F. Conklin, Anderson, Ind. Has two separate windings, an outer and an inner, each connected to a separate commutator.

**1,059,358. Electric Rat-Trap.** C. W. Griffith, Altoona, Pa, assignor of one-half to S. A. Trees. Has an electric lamp in the trapping compartment and an electrocuting circuit in the adjoining compartment.

**1,059,366. Process of Preparing Filaments for Incandescent Lamps.** W. G. Houskeeper, assignor to Westinghouse Lamp Co. Currents of different phase are passed through different portions of the filament.

**1,059,369. Shoe-Polishing Machine.** E. W. Johnson, New York, N. Y. Motor-driven.

**1,059,390. Electric Welding Machine.** R. C. Pierce, assignor to Toledo Electric Welder Co., Cincinnati, O. Includes a number of differently shaped, swingingly mounted, die-carrying horns.

**1,059,391. Receiver for Wireless Transmission of Signals.** V. Poulsen, Copenhagen, Denmark. The wave detector is intermittently connected to the antenna.

**1,059,397. Electrical Terminal Device.** O. S. Schairer, assignor to Westinghouse Lamp Co. Consists of a receptacle with upturned prongs and containing mercury.

**1,059,407. Starting Device.** T. K. Strand, Rolette, N. D. Relates to special connection of the ignition-magneto shaft and the engine crankshaft.

**1,059,409. Reservoir and Pump Therefor.** R. H. Thomas, Chicago, Ill. Includes a gravity-float-controlled, motor-driven sewage pump.

**1,059,416. Switch.** T. S. Watson, C. A. Rhine and C. H. Keeney, assignors to Union Electric Manufacturing Co., Milwaukee, Wis. A motor switch that must be thrown to starting position before it can be thrown to running position.

**1,059,435. Electric Transformer.** C. L. Campbell, assignor to Campbell Electric Co., Lynn, Mass. A core-type transformer with secondary on one leg and primary with a few turns of secondary winding on the other leg.

**1,059,441. Lighting Fixture.** F. S. Crowell, Toledo, O. An extensible chandelier.

**1,059,451. Arc Lamp.** G. Geiger, Munich, Germany. A self-regulating projector lamp.

**1,059,488. Apparatus for Producing X-Ray Kinematographic Pictures.** J. Rosenthal, Munich, Germany. Includes solenoid control of the plate holders.

**1,059,499. Electric Furnace.** E. Stassano, Turin, Italy. The melting chamber is tiltable in two directions.

**1,059,505. Electric-Light Bath or Treatment Apparatus.** R. X. Tuttle, assignor to Good Health Publishing Co., Battle Creek, Mich. The lamps are mounted in a tubular frame resting on top of the bath tub.

**1,059,529. Telegraph Transmitter.** P. P. Dow, Montreal, Can., assignor of one-third to A. B. Manning. Includes a tremolant arm, an electromagnet and a special key.

**1,059,546. Sign.** G. H. Lawrence, Colfax, Wash. A rotatable sign with electric lamp at each end.

**1,059,562. Motor Vehicle.** L. S. Pfouts, Canton, O. Relates to the method of mounting the motor and connecting its armature shaft.

**1,059,583. Electric-Circuit Lock.** D. W. Wilt, San Diego, Cal. The latch on the switch-box cover cannot be opened till the switch is "off."

**1,059,586. Fire Alarm.** A. Allan and T. Bowling, Wellington, New Zealand. Expansion of gas in a pipe causes liquid in trap to close the circuit.

**1,059,617. Socket for Electric Lamps.** G. C. Knauff, Chicago, Ill. Has a lamp socket at one end and a plug-receiving socket at the other.

**1,059,629. Insulator.** T. M. Platt, Philadelphia, Pa. Has a transverse slot with an obstructing lug at the middle of each end and an offset slot by-passing the lugs.

**1,059,634. Method of Feeding Molten Glass to Molds.** L. W. Proeger, Pittsburgh, Pa. Electrical control for the vacuum means of cutting off the flow of glass.

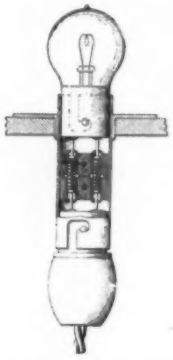
**1,059,650. Plug Connection for Electrical Work.** A. A. Warner, assignor

to Landers, Frary & Clark, New Britain, Conn. Within a cylindrical insulating casing is a triangular sheet-metal spring connector.

**1,059,665. Wireless Telegraphy.** R. A. Fessenden, assignor to S. M. Kintner, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. A multiple antenna consisting of several separate conductors and means to alter the capacity of some of them by the influence of others selected.

**1,059,666. Apparatus for Wireless Signaling.** R. A. Fessenden, assignor to S. M. Kintner and H. M. Barrett. Provides an electrostatic shield between the primary and secondary of the transformer.

**1,059,690. Telephone Repeater.** D. H. Wilson, assignor to D. H. Wilson and R. Bines, New York, N. Y. Includes a double core with primary coils in series with line and a transmitter, and secondary connected to receivers whose diaphragms act on transmitter.



1,059,617.—Double Socket.

**1,059,763. Relay for Undulatory Currents.** E. Reisz, assignor to Relais-Gesellschaft M. B. H., Vienna, Austria-Hungary. Includes an exhausted discharge tube, the cathode rays of which act as an ionizer.

**1,059,769. Acoustic Apparatus.** E. Rubes, Brooklyn, N. Y. An automobile or similar horn with motor-driven resonator and diaphragm.

**1,059,771. System of Control for Induction Motors.** A. Scherbius, Baden, Switzerland. Includes a frequency-changer supplying current to the motor rotor and a commutator machine supplying current to the stator.

**1,059,772. Driving of Single-Phase Motors.** K. Schnetzler, assignor to Aktiengesellschaft Brown, Boveri & Cie., Baden, Switzerland. Two motors with mechanically connected rotors have their stators connected to three-phase mains through an auto-transformer.

**1,059,786. Process and Device for Lighting Submerged Ultra-Violet-Ray Sterilizing Lamps.** P. G. Triquet, Paris, France. Has means for rotating the tube-holding stirrup.

**1,059,788. Power-Transmission Gearing.** E. Upton, assignor to Upton Machinery Co., St. Joseph, Mich. For a motor-driven washing machine.

1,059,629.—Top View of Insulator.

559,134. Milli-Ampere Meter. C. M. Hollopeter, Fostoria, O.

559,143. Electric Light and Signaling Device. D. Misell, New York, N. Y.

559,149. Electric-Light Shade. H. Stenz, Faribault, Minn.

559,168. Connector for Electricity-Carrying Cables. D. E. Evans, Baltimore, Md.

559,175. Electric Railway. R. M. Hunter, Philadelphia, Pa.

559,176. Magnetizing Box for Hairpins. C. A. Hussey, New York, N. Y.

559,187. Electric Governors. K. B. Miller, Washington, D. C.

559,190. Electric Attachment for Paper-Ruling Machines. J. McAdams, Brooklyn, N. Y.

559,223. Electric Boiler. F. W. Schindler-Jenny, Kennelbach, Austria-Hungary.

559,232. Socket for Incandescent Lamps. J. C. Tournier, Schenectady, N. Y.

559,256. Plowing by Electricity. F. Brutschke, Charlottenburg, Germany.

559,240. Electrically Controlled Clutch. F. A. Weller, Boston, Mass.

559,274. Art of Telephoning. D. H. Fitch, Cazenovia, N. Y.

559,275. Trolley for Electric Cars. J. L. Foster, Waterbury, Conn.

559,280. Circuit-Breaker. M. J. Griffith, Wilkes-Barre, Pa.

559,282. Electric Lamp. R. Hacking and G. Brand, Nottingham, England.

559,342. Electric Traction-Motor. J. F. Place, Montclair, N. J.

559,348. Telephone Switchboard. H. M. Fisk, Austin, Ill.

558,924. Multiple-Series System of Electrical Distribution. F. B. Badt, Chicago, Ill.

558,953. Eccentric Mounting for Electric Vehicle Axles. E. W. G. C. Hoffman, Charlottenburg, Germany.

589,971. Electric Connection. J. W. Marsh, Pittsburgh, Pa.

558,983. Current-Straightening Commutator. C. Pollak, Frankfort-on-the-Main, Germany.

558,989. Hanger for Arc Lamps. L. A. Scoville, Chicago, Ill.

559,038. Automatic Electric Indicator System. G. E. Painter, Baltimore, Md.

559,039. Electrical Signaling Apparatus. G. E. Painter.

559,048. Electric Running-Light and Signal-Lantern for Ships. J. Barre, New York, N. Y.

559,066. Mast Arm for Electric Lamps. J. J. Shickluna, Buffalo, N. Y.

559,086 and 559,087. Telephone and Calling System. C. B. Smith, New York, N. Y

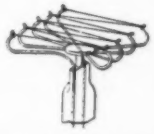
559,088. Telephone and Calling System. J. G. Smith, New York, N. Y.

559,105. Electric Railway Conduit. J. H. Munson, Chicago, Ill.

559,106. Telephone Transmitter. F. A. Ray, Springfield, O.

559,122. Endoscopic Instrument. J. W. Daily, Boston, Mass.

559,131. Signaling Apparatus for Pressure Gauges. T. M. Gordon, Boston, Mass.



1,059,737.—Incandescent Lamp Filament.

**1,059,705. Incandescent-Lamp Manipulator.** A. E. Binz, Plainfield, N. J. Has bulb-gripping fingers operated by an eccentric.

**1,059,706. Selective Relay.** E. R. Brodton, assignor to Modern Electric Appliance Co., Mobile, Ala. Associated with a signaling relay at the receiving station.

**1,059,717. Safety Attachment for Elevator Doors.** R. R. S. Dobson, New York, N. Y. Leaving any door open breaks the elevator-control circuit.

**1,059,737. Incandescent Lamp.** A. S. Knight, assignor to Westinghouse Lamp Co. Has a single reversely bent filament the legs of which occupy a plane normal to the axis of the lamp.

**1,059,738. Support for Incandescent-Lamp Filaments.** A. S. Knight, assignor to Westinghouse Lamp Co. The support has an intermediate notch to which the filament end is secured.

**1,059,742. Fixture.** W. Lumley, assignor to General Electric Co. Of the Tungstolier type, has special interlocking seats for the arms.

**1,059,745. Telephone Metering System.** E. H. Martin, Webster City, Ia. Part of the metering mechanism is inclosed in the receiver shell.

**1,059,758. Telephone Time-Signal.** W. Pothen, Murdock, Minn. A clock-controlled alarm.

**1,059,759. Electric Alarm for Locks.** J. H. Preston, Ottawa, Ont., Can. A special, partly insulated key does not close the alarm circuit, but an ordinary key does.

**1,059,828. System for Vehicle Control.** J. T. Cade, Arcola, N. J., assignor to Federal Signal Co. Includes track-circuit control.

**1,059,835. Electric Signaling Device.** G. Christian, assignor to Wilcke-Armstrong Co., Detroit, Mich. A special hammer construction for electric bells or gongs.

**1,059,846. Electric Switch.** F. C. De Reamer, assignor to General Electric Co. A key-switch construction for a lamp socket.

**1,059,903. Insulator with Fuse.** K. Petterson, Sarpsborg, Norway. A hook for supporting the insulator passes between two of the petticoats and then upward near the axis.

**1,059,925. Electrical Distribution System.** G. Blank, New York, N. Y. Has an automatic switch for connecting one or another branch to the service circuit.

**1,059,930. Mount for Electric Motors.** G. Dinkel, assignor to American Tool & Machine Co., Boston, Mass. A vertical motor whose rotor shaft is supported by a universal joint.

**1,059,931. Trolley Wheel.** M. E. Drake and D. B. Barnett, Bessemer, Ala. Has rotatable flat disks on each side of the wheel.

**1,059,944. Calling Device.** F. R. McBerty, assignor to Western Electric Co. An electromagnetic step-by-step selector.

### Patents That Have Expired.

Following is a list of electrical patents (issued by the United States Patent Office) that expired April 28, 1913:

# Electric Vehicle Section

## Electric Booming in Denver.

Denver now has two companies engaged in the manufacture of both commercial electrics and pleasure cars. The latest company to enter the truck manufacturing field in that city is the Capitol Truck Company, which has been formed by a group of local capitalists. Trucks of 1,000-pound and two-and-one-half-ton capacities are being turned out by the company, but it is expected that as soon as the factory is well underway larger machines will be included in its list.

The other company manufacturing electric trucks in Denver is the Fritchle Automobile & Battery Company, which has been in the business for a number of years. A number of local merchants have been supplied with Fritchle electrics, the most notable being the Daniels & Fishers Stores Company and the Denver Gas & Electric Light Company, each of which has a 1,000-pound wagon in service. According to all reports the trucks have proved very satisfactory and the record established by the Fritchle electric promises to place it in the front ranks as a reliable commercial trucking medium.

So far the Capitol Truck Company has disposed of two machines, although it has been manufacturing only two months. One truck was purchased by the Denver Gas & Electric Light Company for use in delivering small appliances to its customers. On a recent occasion the machine traveled a total of 84 miles on one charge of the batteries and made 35 stops for deliveries.

Among the principal mechanical features of the Capitol electric are a worm drive, with nine-to-one gear reduction. American ball-bearing axles and full elliptic springs are used, along with General Electric motors and controllers. The machines are fitted with Gould batteries of 30 cells, 15 plates to a cell, having a capacity of 192 ampere-hours. The wheel base is 104 inches and the tires are 34-inch by 4-inch pneumatics.

Truck selling in Denver has been rather brisk during the last few weeks. The Denver *Post*, an evening newspaper, which also operates a coal yard, has purchased a five-ton G. M. C. electric for hauling coal to the North Side. In this section of the city the streets during rainy and snowy periods are very bad in some localities and the Denver *Post* found through long experience with horses that it was almost useless to attempt deliveries of coal in this section of the city with horse equipment during the time the streets were in bad condition.

The management decided that it would have to install some kind of equipment that would insure deliveries to these localities no matter what the weather conditions. After a careful and painstaking investigation of all kinds of power vehicles the company decided that it would install a truck of the electric type. With this machine the company expects to do all delivering to the North Side and horses will be used for the deliveries to other sections where better streets may be found.

The installation of this machine is the forerunner of a large electric delivery system, provided the electric meets with the expectations of the Denver *Post* management.

Another G. M. C. has recently been purchased by a contractor in charge of the Antero Irrigation Project. It is a five-ton truck and will be used for hauling cement, concrete and earth used in the construction of the Antero dam. The performance of this machine will be watched with interest, as the work is of a kind that will give the electric a severe test and if it succeeds in "holding up its end" there is no question but what the electric will have firmly established itself as a powerful trucking medium in this section of the country. This machine, no doubt, will be put to a kind of work that is unlike city drayage and the roadways in the vicinity of the dam will probably be anything but favorable to the operation of the machine.

Besides these two cars the Herbert Confectionery Company has purchased a 1,000-pound Capitol truck and there are several other companies which have about closed contracts for the purchase of five machines ranging in capacity from 1,000 pounds to three-and-one-half-ton capacities. The truck selling business in this locality is looking to the fore at the present time and there is every indication that the business will take a big brace by the middle of spring.

The dealers are very optimistic and report that prospects are looking into the truck question with a great deal more interest than heretofore. At the recent automobile show many of the local manufacturers had a large number of inquiries and some of them report good business, especially in the pleasure car line. The Carstarphen Electric Company local agent for the General Vehicle Company and the Flanders pleasure car, report the sale of a number of the pleasure vehicles and it also has some merchants who are looking into the trucking problem. It expects to sell a number of G. V. electrics to the prospects secured through the automobile show.

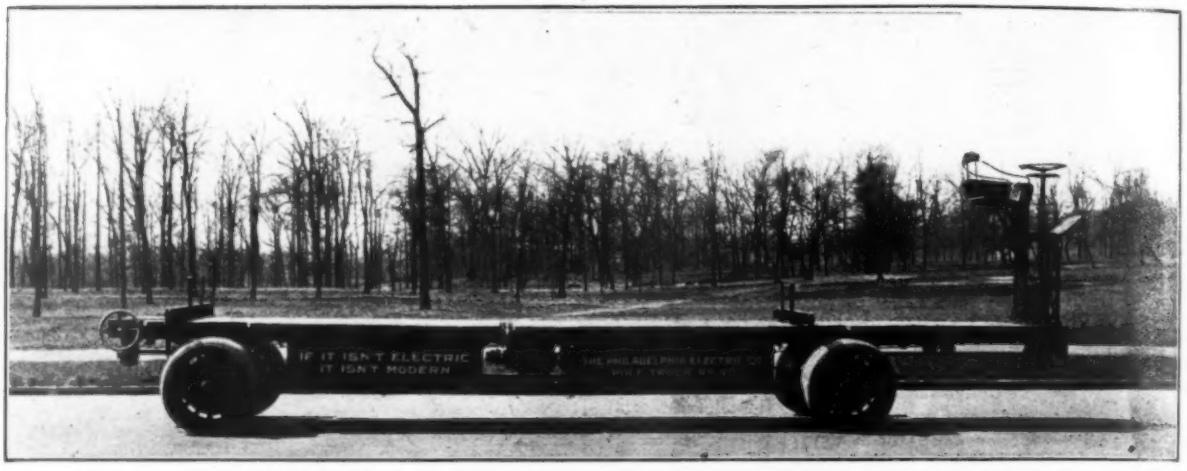
J. L. Armstrong, the Baker agent, is also pleased with conditions and says he expects to install a number of trucks in the service of local business men in a few weeks.

## Something New in Electric Trucks.

That the electric truck may be adapted to a great variety of uses is a well-established fact, but it has remained for the Philadelphia Electric Company to be the first to utilize this type of truck for the purpose of hauling poles. The new truck was designed and built by the Commercial Truck Company, of Philadelphia, at the suggestion of A. H. Manwaring, and while it has just been put in service, there is every reason to believe that the economies to be effected in time and labor over the horse-drawn vehicle will justify the further adoption of this type of truck for hauling poles.

The distribution of wooden poles has always been one of the most troublesome problems confronting the transportation department of this company. This has become more serious in the last few years, owing to the rapid increase in the use of excessively high poles, due to the extension of high-tension transmission lines, which necessitates the placing of such wires over the wires of all other companies, and over railroad crossings at a clearance not less than 30 feet above the rails. It has been the practice of this company to distribute such poles by the use of horse-drawn trucks, the rear wheels of which are rigid, and for this reason turns must necessarily be made with a very large radius.

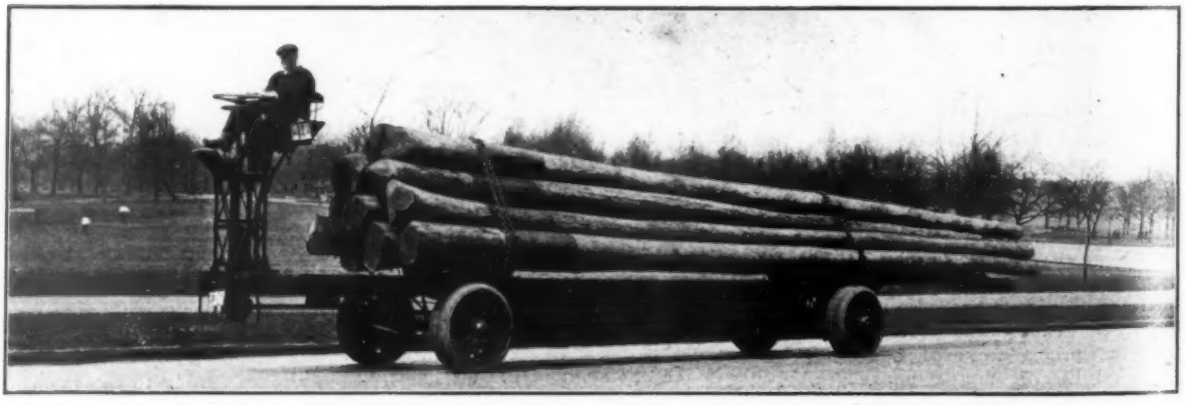
Some of the poles used in the work are 90 feet long and are very difficult to handle in congested sections of the city. In making turns consideration must be given not only to the length of the poles, but also the space occupied by two or more horses in tandem —sometimes the length of street occupied by the loaded vehicle and horses is as much as 130 feet.




Philadelphia Electric Company's Electric for Hauling Poles.

For a number of years the construction of an electric truck has been under consideration, which would embody the following advantages: The space occupied by the loaded truck to be limited to the length of the poles, this to be accomplished by allowing the poles to overhang at both the front and rear ends; a truck that would turn in a comparatively small circle; a truck that would cover more ground at a greater speed than a horse-drawn vehicle; a truck so constructed as to permit of the loading and unloading of poles by electric power. All of these advantages are embodied in the new truck, illustrations of which are shown herewith.

The devising of a satisfactory method of steering such a long vehicle proved to be quite a problem. It would be a simple matter to control the front and rear wheels from the driver's position, but under such conditions the front and rear wheels would turn in opposite directions. This would not be satisfactory in a pole truck, because of the fact that poles are unloaded at the curb line, and in getting away from the curb, while the front wheels would leave, the rear wheels would run into the curb. The control of the rear wheels by an upright standard and an additional steering wheel was also impracticable, for the reason that this arrangement would prohibit the loading and unloading of the poles from either side of the truck. All these difficulties have been overcome in the present design, which provides for the steering of the rear wheels from the side of the truck, so arranged that it can be locked when the wheels are in a neutral position. This enables the truck to be controlled entirely by the front steering mechanism, the rear steer being used only when short turns are necessary.



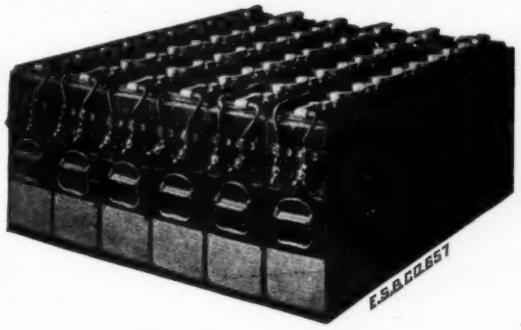
Philadelphia Electric Company's New Electric Truck Loaded With Poles.

On account of the greater weight on the front wheels when the truck is running empty the brakes were made to operate the front wheels, as well as the rear wheels, in order to eliminate any tendency to skid.

The loading and unloading of poles are accomplished by an electric winch located in the centre of the truck. This winch is wired so that it can be controlled from switches under the seat or from either side of the truck at the motor, and when in operation the control of the truck itself is cut out. By this winch it is possible to place poles in any position on the truck and even when the truck is partially loaded, additional poles can be placed at the top of the pile. This is particularly advantageous inasmuch as it is only necessary to detail two men (a driver and a helper) with the truck when loading or unloading poles, which can be done much more rapidly than has been practicable with four men heretofore. This undoubtedly is one of the most important features in connection with the new truck.

The truck itself is of six tons ca-

# They Believe In "Electrics" They Rely On




# The "Exide" Batteries

"Exide" "Hycap-Exide", "Thin-Exide", "Ironclad-Exide"

**Here is a list of some of the largest and most prominent users of electric commercial cars in the country. This list should furnish "food for thought" for Central Stations. The experience of these concerns has demonstrated that "Electrics" equipped with the "Exide" Batteries are a proved success.**

American Express Co.
Gimble Bros., New York City
Anheuser-Busch Brewing Assn., St. Louis
Philadelphia Electric Co.
Jacob Ruppert Brewing Co., New York City
F. A. Poth & Sons, Philadelphia
United States Express Co.
Marshall Field, Chicago
Commonwealth Edison Co., Chicago
R. H. Macy & Co., New York City
United States Government
United States Post Office Service
Rochester Railway & Light Co.
H. C. & A. I. Piercy, New York City
Woodward Lathrop, Inc., Washington
Louis Bergdoll Brewing Co., Philadelphia
James A. Hearn & Sons, New York City
Gorham Co., New York City
B. Altman & Co., New York City
Union Electric Light & Power Co., St. Louis
Halle Bros., Cleveland
Geo. Ehret, New York City
C. Schmidt & Sons Brewing Co., Philadelphia
United States Navy Yard, Washington
Tenney Syndicate, Boston
United Gas Improvement Co., Philadelphia
Krey Packing Co., St. Louis
Edison Electric Illuminat'g Co., Brooklyn
Borden's Milk Co., Brooklyn
Brooks Bros., New York City
Consolidated Gas, Electric Light & Power Co., Baltimore
New York Edison Co.
Chapin-Sacks Manufacturing Co., Washington
H. B. Claflin Co., New York City
Public Service Corporation, Jersey City
Bernheimer & Schwartz, New York City
Loewers V. Gambrinus Brewery Co., New York City
Arnold Constable & Co., New York City
United Electric Light & Power Co., New York City
General Electric Co.
Union Transfer Co., Philadelphia
John Wanamaker, Philadelphia
Amoskeag Manufacturing Co., Manchester, N. H.
Oregon Auto Dispatch, Portland, Ore.

**In following the judgment of such expert battery users you cease experimenting.**

***The people who buy batteries in the largest quantities are the best judges of the best battery to use.***

**Endorse the four "Exide" Batteries. They are designed for all kinds of electric vehicle service. Our nearest office is always at your service.**

## THE ELECTRIC STORAGE BATTERY CO.

MANUFACTURER OF

The "Chloride Accumulator", The "Tudor Accumulator"
The "Exide", "Hycap-Exide" "Thin-Exide" and "Ironclad-Exide" Batteries

New York Boston Chicago St. Louis Cleveland Atlanta Detroit

**PHILADELPHIA, PA.**
1888-1913

Denver San Francisco Seattle Los Angeles Portland, Ore. Toronto

pacity and weighs, when unloaded, about 12,000 pounds. The division of the unloaded weight is 60 per cent on the front wheels, or 7,200 pounds, and 40 per cent on the rear wheels, or 4,800 pounds. Calculations have been made, showing the positions to be occupied by the various lengths of poles on the truck, in order that the load will be equally distributed between the front and rear wheels.

The truck is operated by four-motor drive, which is necessary in order to provide proper traction for such a long wheel base. The batteries (42-cell, 21-plate, M. V. Exide) are located in a compartment under the bed of the truck in front of the centre. A compartment to the rear of the centre is utilized for carrying tools, such as cant hooks, jacks, short skids, rope, etc.

A number of interesting features of the truck are as follows: the weight of the steel used in its construction is 5,750 pounds; the weight of the rubber in the tires is 1,750 pounds, the length over all is 31 feet, 6 inches; the wheel base is 20 feet. With the rear wheels locked in the neutral position the truck will turn in a radius of 40 feet. By using both front and rear steering wheels the truck will turn in a radius of 18 feet. The truck has a mileage capacity of approximately 30 miles at full load. Its speed is approximately seven miles per hour on the level at full load. The four-motor drive will enable the truck to navigate through almost any condition of roadway, and on trial it successfully carried a full load up a nine per cent grade.

The new truck has also a decided advertising value. The name of the company is conspicuously displayed as well as the company's motto, "If it isn't Electric, it isn't Modern!" The truck attracts considerable attention and wherever it stops a crowd collects, not only the idle curious but usually the progressive type of business men. Innumerable questions have been asked regarding its operation and without a doubt it has done more to attract the general public to the use of electric vehicles than any vehicles placed on the street since the electric tower wagon for trimming arc lamps.

## Field for Electric Automobiles in France.

Although France is usually looked upon as the birthplace of the automobile, there are many French cities even as large as Bordeaux (population 262,000) in which electric automobiles are still unknown. In the neighborhood of Bordeaux the cost of gasoline is 36 to 41 cents a gallon. The field here is considered worth cultivating by American electric vehicle manufacturers.

## The Electric Vehicle from the Teamster's and Driver's Viewpoint.

The regular monthly meeting of the Electric Vehicle Association of America was held in the Engineering Societies Building, New York City, on Tuesday evening, April 22, 1913.

The president, Arthur Williams, presided, and a paper "Why Teamsters and Carriage Drivers of Today Absolutely Believe in the Necessity of the Motor Vehicle," by Daniel J. Tobin, general president of the International Brotherhood of Teamsters and Chauffeurs of America, was presented.

In the absence of the author, the paper was read by William H. Ashton, the general organizer of the Brotherhood.

In it the Brotherhood stated most emphatically that they believed absolutely in the necessity of the motor vehicle to take the place of horsepower.

They took this stand for three reasons; first, because of the increased traffic of the present day; second, because the present situation demanded the change; third, because the motor vehicle in time will tend to relieve the strain on the men employed in handling the passengers and merchandise of our great industrial centers.

They were aware of the fact that the public was somewhat prejudiced against the motor vehicle chiefly on account of the numerous accidents it has made.

These accidents were no doubt due to carelessness and in the future could be eliminated if the motor vehicle was operated by a competent well balanced individual.

The purchasing public could be advised by the manufacturers of the motor vehicles to this end.

In the International Brotherhood of Teamsters and Chauffeurs of America over 90 per cent of the chauffeurs were formerly teamsters or drivers of horse-drawn vehicles. They were men who were already familiar with the methods of handling merchandise, and the Brotherhood was not opposed to their handling that merchandise in their present capacity as chauffeurs. In some of the larger cities the Brotherhood had purchased motor vehicles and undertook to "break in" the teamsters during the slack season, so that in the event of their employer changing over to motor-driven vehicles his men would be found competent to be placed in charge of them.

In conclusion, it was hoped that "wherever possible organizations of labor be looked upon not as enemies of progress, but as institutions of education wherein are taught only the true principles of Americanism and good citizenship, who welcome every change towards the uplifting of humanity and who create greater harmony between the men of brains who invent the machinery which thereby relieves the strain on those who have to toil physically for an existence in this great country of ours."

The paper was received with applause, and President Williams characterized it as a distinct contribution to the cause of labor. As an arbitrator of labor disputes he had come in contact with the heads of organized labor and had found them possessed of an intelligence of no small order. He was greatly in favor of the teamsters being retained and trained as chauffeurs when a change from horse-drawn to motor-driven vehicles was made. The value of the change from an educational standpoint was evident, for the men could not help taking an interest in the machinery under their control and eventually become familiar with its details and operation. Then, again, the very fact that they had in their charges, expensive and complicated machinery made for moral uplift.

In the discussion which followed, all were united regarding the spirit of the paper, it being such spirit which promoted peaceful industry. All were also united in their view of the intelligence of the teamster and of his ability after proper training to operate motor-driven vehicles. As to whether he should handle the merchandise and keep his machine in good order as well as operate the vehicle, the opinion was divided, it being thought in some cases that greater economy could be attained by having another man to handle the merchandise, and in the case of a large fleet of vehicles a competent repair staff to effect repairs.

## Market for Electric Motor Cars in England.

Consul Albert Halstead, Birmingham, England, states that his office has had considerable correspondence with American manufacturers of electrically propelled vehicles who were considering their introduction into the United Kingdom. A number of years ago an effort was made to popularize the electric vehicle there, but troubles with batteries, difficulties of construction, and poor design prevented its sale. Since the remarkable improvements in storage batteries and design made by American manufacturers all these drawbacks have been removed. The price of electricity is sufficiently low to make the use of electric vehicles profitable for commercial purposes, but the difficulty has been and continues to be that the electric supply companies and the

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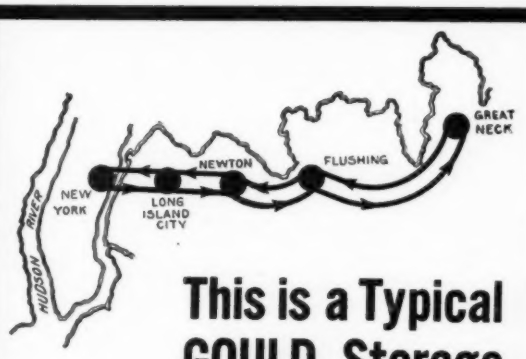


# This is a Typical GOULD Storage Battery Stunt

A large brewing company in New York, having trouble with gasoline cars continually breaking down, recently decided to try out electric vehicles, some equipped with Gould Storage Batteries. An electric truck delivered a 5-ton load to Great Neck, L. I., and returned with a load of empties—distance 45½ miles. Two days later this performance was repeated. It was noted that on trips where electric vehicles equipped with other batteries were used, those with Gould Batteries came back two hours ahead of the others.

This is not unusual for Gould Battery-propelled cars. 45½ miles is a short distance—an every day matter. But the point is this: Gould Batteries invariably do their work at a year-in-year-out cost far lower than shown by other batteries.

If you use gasoline cars or electric vehicles propelled by batteries other than Gould Batteries or are figuring on an electric pleasure or commercial vehicle, equip with Gould Batteries and keep tab on first cost, frequency of renewals, cost of renewals, mileage per charge, total mileage, efficiency, etc. Do so and you will eventually equip all your cars with Gould Batteries.

There's no question about electric propulsion being best—it is. There's no question about batteries either: Gould Batteries are best. Look into this matter. Facts, figures, and literature await your inquiry. Ask for our free book "Care of Storage Batteries."

**Gould Storage Battery Co.**

**General Offices: 30 E. 42nd St., New York City**

**Boston: 89 State Street Chicago: The Rookery**
**Cleveland: Amer. Trust Bldg. San Francisco: 904 Rialto Bldg.**
**Works: Depew, New York**

**Agents**

**Detroit Topeka Los Angeles Seattle**
**Montreal Toronto**

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municipal electric supply departments have not encouraged the use of electricity as they might have done with profit.

### Cost of Gasoline Makes Promising Conditions for Electric Vehicles.

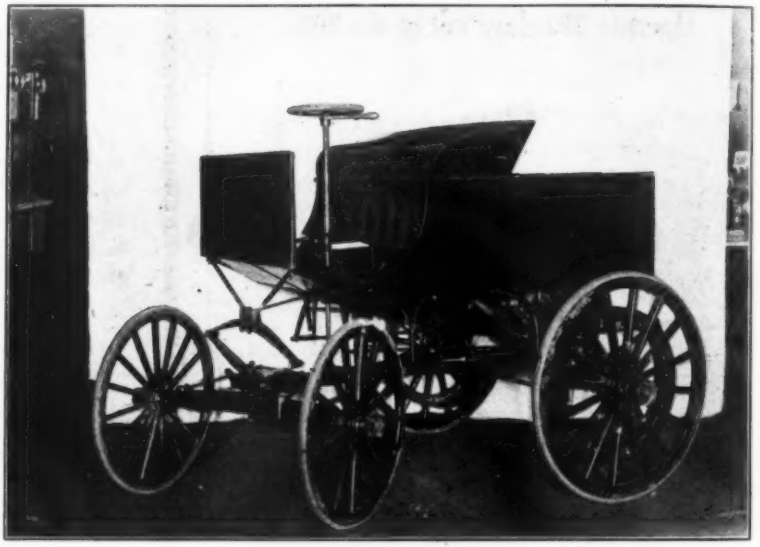
An article on the subject in the *Hardware Trade Journal* of March 14 says:

"The makers of electric vehicles seem to be rather neglecting their chances just now. With the rapid rise in the price of petrol (gasoline), which was little more than 25 cents a gallon 12 months ago and is now 43 cents, an increase of 75 per cent, the disadvantage of the comparatively high running cost under which the electrically driven vehicle labored has disappeared, and with electrical energy at its present price, and a certainty that it will be reduced rather than increased in the near future, a tradesman could run a small electric carrier more cheaply than one which depended on petrol. The latter under most favorable conditions would run only some 45 or 50 miles per gallon. Excluding all other costs but that of petrol, as tires would be common to both types of vehicle, it costs, roughly, 43 cents to travel 42 miles or one cent a mile. And in excluding other costs we are treating the petrol carriers very fairly, as a quart of oil costing about 24 to 36 cents would be required every 350 miles or thereabouts with a petrol engine, and with an electric motor a cupful of oil would last a good many months. A six-horsepower petrol motor would, roughly, be about 900 cubic centimeters capacity as regards cylinders, or about nine actual horsepower. An electric motor of nine-horsepower would take about 10,000 watts, or, roughly, 10 units per hour which at one cent per unit—a common price now for battery charging—would be 10 cents for about 20 miles. For 42 miles the electric motor would cost about 22 cents compared with the 43 cents of the petrol-driven vehicle. Of course these figures are largely approximate, but it would appear that the hardware man engaged in the electrical trade might do worse than get in touch with the makers of small electrically propelled vehicles and see what prospects there are of trade."

It would seem in these circumstances as if makers of electric automobiles in the United States might well investigate the British market and arrange with electric supply companies and municipal electric supply departments to facilitate battery charging. Already three American electric automobiles have been introduced in London for commercial purposes, but whether others have followed is not stated.

### A Pioneer Electric Vehicle.

So much material interest is now being manifested in the electric vehicle, and so rapid has been its development during the last two years, that we are prone sometimes to a belief that it is essentially a thing of recent growth. It is true that within very recent times there has been a conspicuous improvement not only in the design of the vehicle and its mechanical equipment, but that storage batteries, motors and other accessories have all contributed to the popularity which has now been achieved through various degrees of very necessary improvement. In considering any modern and acceptable equipment it is always interesting to note the way in which the up-to-date device harks back to generic conditions, and in this connection a very interesting commentary in this matter is the electric vehicle designed and constructed by William H. Blood in Kansas City, Mo., in 1893, just 20 years ago.



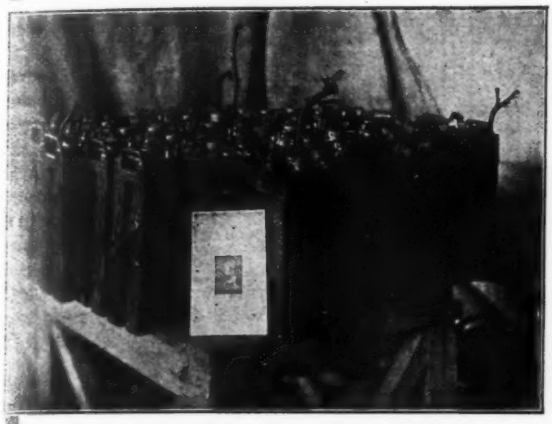
A Pioneer Electric Vehicle.

Mr. Blood has always taken a great interest in the electric vehicle, and it is quite fitting that his keen understanding of the electric vehicle situation and his great sympathy with its development should have been recognized in electing him to the presidency of the Electric Vehicle Association of America last year.

In building the electric vehicle 20 years ago Mr. Blood had no data to direct his efforts. He had to guess at everything. The body of the old machine was of the ordinary buggy type. The seat was arranged for two people and the steering wheel was geared to a segment of the front wheels, the two wheels turning on a king-bolt just as with an ordinary buggy. The spring suspension was copied from the buggy construction. Solid rubber tires were used, and on smooth streets the riding was all right. The motor was designed by Mr. Blood and was of approximately three horsepower and able to do about 100 per cent overload for short periods.

The drive was unique. The armature shaft was very long and had on each end of it a raw-hide wheel in place of a pinion. These raw-hide wheels drove by friction against cast-iron flanges bolted on the inside of the rear wheels. This friction was obtained solely by the weight of the motor, which was arranged to move up and down. In order to get a large amount of torque in the event of the vehicle getting stuck in the mud or other bad places, there were placed near the dash two pedals. By pressing down on these two pedals with the feet the motor was raised; the current could then be turned on and the motor would spin. Then by releasing the pedals the motor would come down and the momentum of the armature would temporarily establish a fly-wheel effect, giving a little greater impetus and thus pulling the vehicle out of the mud. The batteries were built by the Electric Storage Battery Company of Philadelphia, of the heavy plate type. This was before the days of the Exide batteries. The car contained 24 cells and operated successfully in Kansas City for several months. It met with an untimely end, however. It was shipped by freight to Philadelphia to get new batteries better accommodated to its requirements, and the freight train met with a wreck and the car was entirely demolished. This machine, Mr. Blood states, did very well in Kansas City.

# If a Cyclone Can't Do It—What Can?



Metal hood was crushed in and battery short-circuited, burning off "jumpers." All cells O. K. on individual test.

Edison Storage Battery buried in car under tons of brick and debris—Omaha, March 23, 1913.

**The Edison Storage Battery is not built for dainty handling, laboratory attention, cast-iron rules of service and "fair weather" conditions. It is THE battery for YOUR service.**

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PART II.—CHAPTER XXIV.—Uses of Batteries. XXV.—Pilot Cell Accessories. XXVI.—End Cells. XXVII.—Control by Counter Cells and Resistances. XXVIII.—End Cell Switches. XXIX.—End Cell Conductors. XXX.—Boosters. XXXI.—Manually Controlled Boosters. XXXII.—Self-Excited Automatic Boosters. XXXIII.—Separately Excited Boosters. XXXIV.—Externally Controlled Boosters. XXXV.—Current Supply for Booster Motors. XXXVI.—Design and Selection of Boosters. XXXVII.—Compounding Booster-Controlled Power Plants. XXXVIII.—Adjusters of Generator Output. XXXIX.—Rheostats. XL.—Circuit Breakers and Instruments. XLI.—Computation of Battery Capacity. XLII.—Direct-Current Systems. XLIII.—Line Batteries. XLIV.—Plant Efficiency. XLV.—Exciter Battery Installations. XLVI.—Alternating-Current Systems. XLVII.—Alternating-Current Controlled Field Regulators. XLVIII.—Current Converter Systems.

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## Increasing the Diameter of Truck Wheels.

*To the Editor:*

The writer has read the editorial in your issue of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of April 5 headed "Progress in Electric Truck Business" with considerable interest and agrees with the statements in the main. There are two points, however, to which I should like to take exceptions.

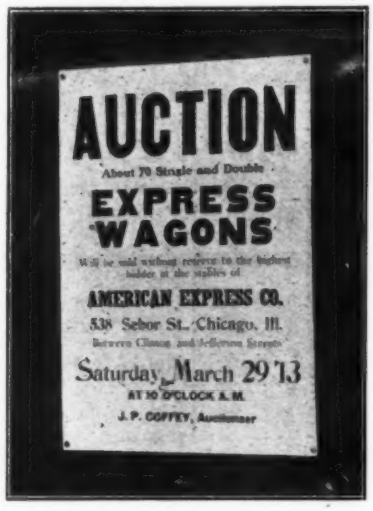
It has not been the writer's observation that there is a tendency to use larger wheels. There certainly is no good reason for doing so except popular prejudice. The reasons given in your article for the use of a larger wheel would apply to a large increase in diameter such as 50 per cent to 100 per cent, but the general result as affected by the change of a few inches in diameter is practically negligible. This will be apparent if two circles representing 32-inch and 36-inch-diameter wheels (for example) are drawn tangent at the same point to a line representing the ground. It will then be apparent that any hole over which the machine might be driven would, in order to materially affect the depth to which the wheel would drop into the hole, have to be so wide that one could not drive over it without danger of damaging the tires and the machine itself unless almost a complete stop were made. If road conditions were such as to require driving constantly over such holes, the use of a machine probably would not pay, as it would not be able to do any more work than a horse-drawn vehicle. The electric machine is essentially a city or, at least, a good roads truck. Careful wattage consumption tests with the same machine do not show any advantage for the larger wheels over any reasonable operating condition. The greater weight of the larger tires and wheels is of course against their use, especially as this weight is in the worst possible place below the springs, a given unsprung weight being many times as hard on tires as far as wear goes as an equal weight carried above the springs.

I also believe that the present tendency is not towards lowering the center of gravity but to get it higher. The line of machines being marketed by this company, which are at least the newest design on the market, have all batteries carried above the frame instead of their being underslung. The primary reason for this was not, of course, to raise the center of gravity, but this raise in the height of the center of gravity has a very advantageous effect upon the machine as a whole and the tires in particular. The side strains on tires are very greatly increased where the weight is carried close to the ground. When the weight is put above the frame, side slipping and lurching around corners, etc., is largely taken care of by the springs instead of by the tires. That this is good practice I think is shown by the installation of the latest Pennsylvania Railway electric locomotives, which carry their motors above the trucks, as well as by all steam locomotive designs where boilers and other weights are carried as high as possible in order to get this same effect.

F. A. WHITTEN,
Chief Engineer Electric Division,
General Motors Truck Company.
Pontiac, Mich., April 12, 1913.

## "A Sign of the Times."

The accompanying illustration of a poster recently exhibited in Chicago is reproduced through the courtesy of George H. Kelly, manager of the truck department of the Baker Motor Vehicle Company, Cleveland, Ohio. On a recent trip to Chicago Mr. Kelly saw this poster posted up in many parts of the city. Reflecting on the 229 Baker electric trucks in express service in 28 different cities in the United States, Mr. Kelly ejaculated, "A Sign of the Times."




"A Sign of the Times."

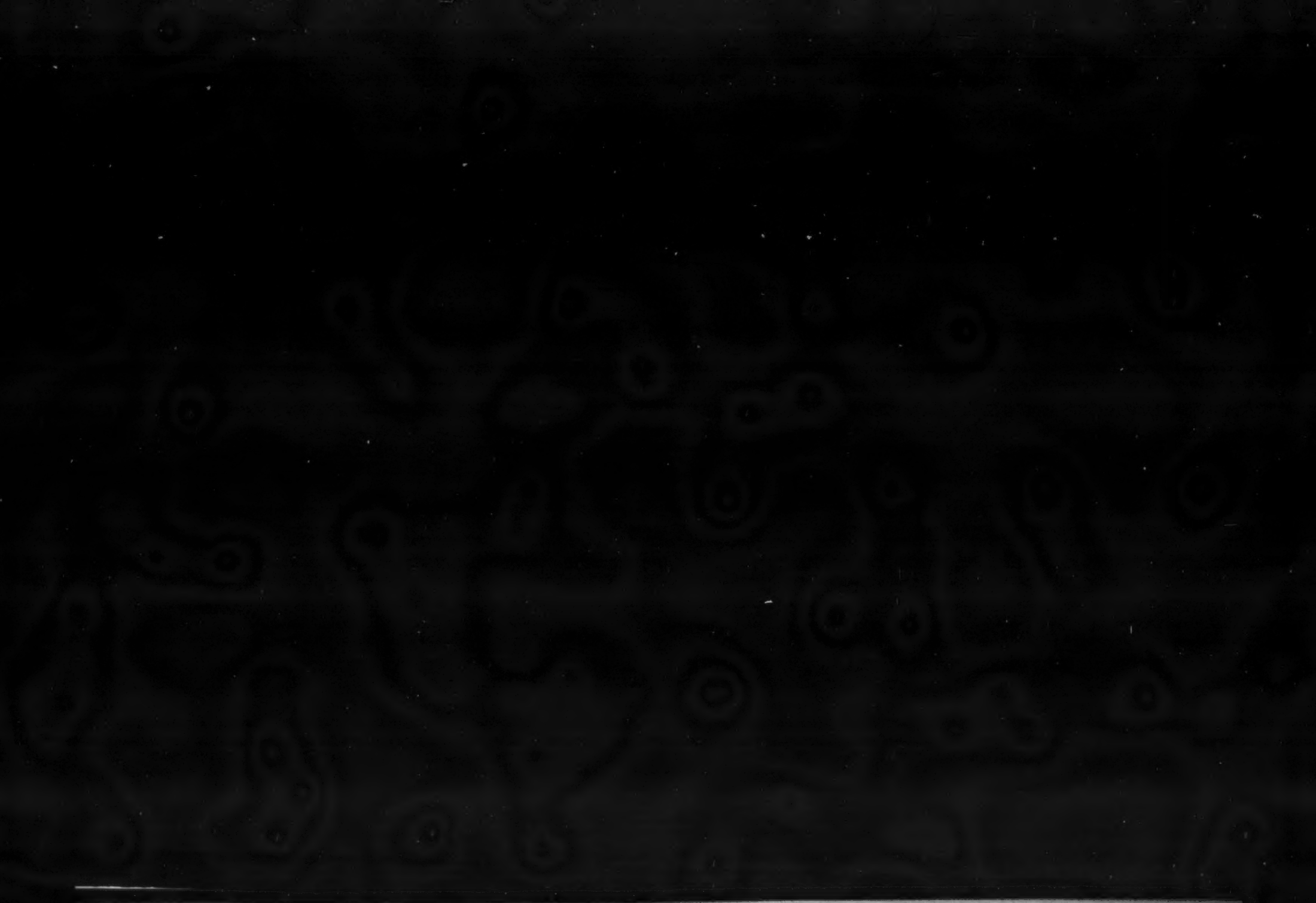
## Western States to Exploit Transcontinental Auto Highway.

The state of South Dakota, together with the states of Wyoming, Minnesota and Wisconsin, are interested in a highway extending from Chicago to the Yellowstone National Park and to be known as the Chicago, Black Hills and Yellowstone Park Highway, with a shorter pseudonym, "The Black and Yellow Trail."

At a meeting recently held in Deadwood, S. D., at which delegates from interested cities and towns along this proposed highway were present, plans were made for beginning active work in mapping and marking this trail from Chicago to the Yellowstone National Park. It was decided to send a party over the line from Chicago to the Park. This party will in all probability leave Chicago immediately after July 4. In the party, there will be the committee appointed by the Deadwood meeting and also newspaper men and representatives of the various states and cities through which the highway passes. A photographer will also accompany the party in order to let the world have an idea of the scenic beauty to be encountered on this highway.

The tentative route as outlined by the committee is to leave Chicago going directly north along the lake shore to Milwaukee, thence westward through Madison to Lacrosse, thence north to Winona, thence west through Minnesota and South Dakota, following closely the line of the Chicago & Northwestern Railway, crossing the Missouri River at Pierre, and west to and through the Black Hills and on to Yellowstone Park. The party will travel in automobiles and make addresses at all the towns and cities enroute.

Benjamin M. Wood of Rapid City, S. D., is the committeeman in charge of the arrangements and he will be glad to correspond with the secretaries of Commercial Clubs, Automobile Clubs, or Good Roads committees in the various cities and towns through which this highway passes. The promoters of this highway intend to exploit it as one of the divisions of an ocean to ocean highway having terminals on the Atlantic and Pacific coasts.

## An Automobile Signaling Device.

The Fling-Buente automobile safety signal system is adapted for use on both gasoline and electric vehicles. The system consists of three lamps displayed on the rear of the body of the car, one well toward the left side of the car, the other well toward the right side, and the third directly between the two. By means of sliding connections on the steering gear, the lever and the brake the lights are flashed an instant before the driver of the car executes an action. For instance, the moment he starts to turn to the right the light on the right side of the car in the rear flashes. When he starts to turn to the left the same thing happens to the light on the left side. If the driver decided to back, the moment he starts to reverse the lever both end lights flash simultaneously, and the moment he applies the brake all three lights glow, showing that the machine is about to stop.